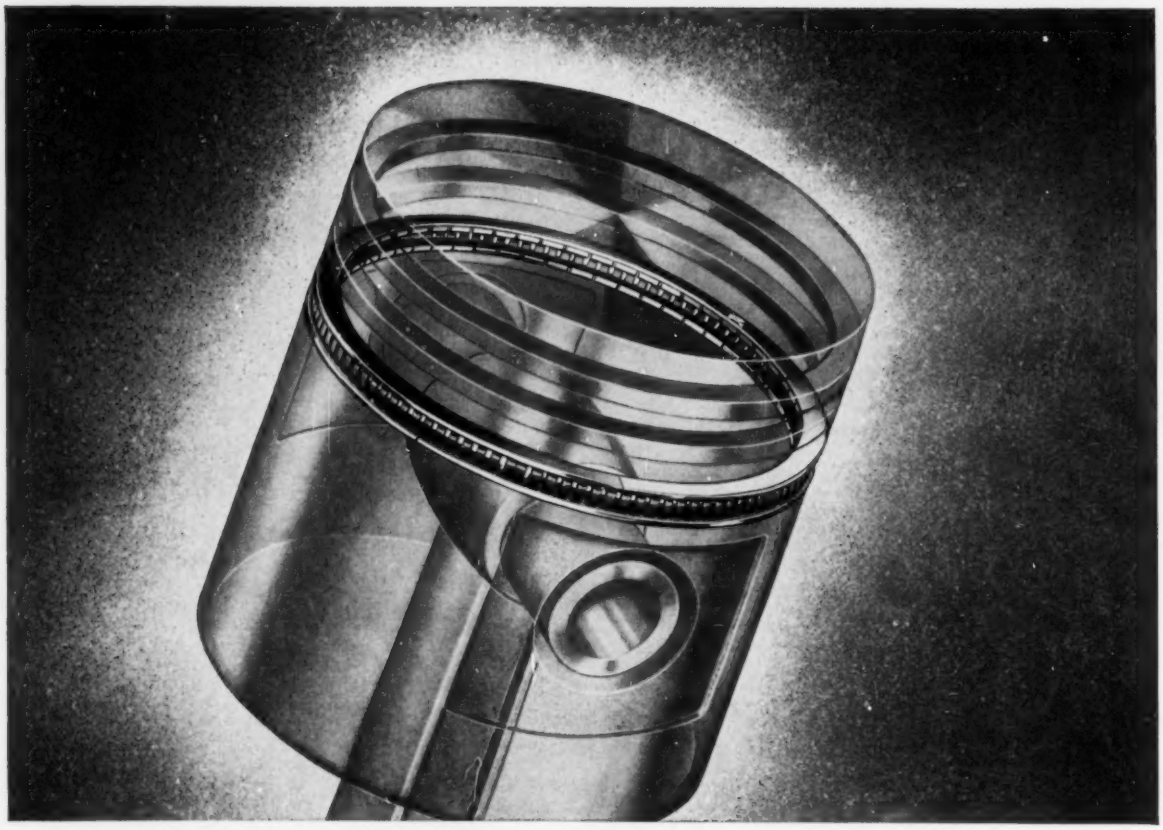
Automotive Service Digest

Our 47th year

January, 1959

How do service shops expand?—See page 16



PERFECT CIRCLE...

first in power protection with "98" oil ring

Perfect Circle's famous "98" has been making high compression history since its introduction just 5 years ago!

THE PROBLEM: To build an oil ring that would seal extreme pressures and forces of high compression engines with minimum wear to cylinder, piston, rings. Ring must provide lubrication, seal against oil loss during *both* compression and vacuum strokes.

THE SOLUTION: Perfect Circle "98" Oil Ring —the first true high performance oil ring— enthusiastically accepted for original equipment and replacement service by most engine manufacturers. Constantly improved since its introduction 5 years ago, construction of ring provides positive cylinder and groove seal during *both* compression and vacuum strokes. Made of highest quality tempered steel, "98" Oil Ring is coated with thick, solid chrome plating that *doubles* life of cylinders, pistons, rings.

INSURE CUSTOMER SATISFACTION! Install Perfect Circle 2-in-1 Chrome piston ring sets and new Perfect Circle Valve Seals for *complete* power protection. You make *more* profit and customer gets top performance and economy at lowest possible cost.

PERFECT CIRCLE

Hagerstown, Indiana — Don Mills, Ontario, Canada

Still the champs
. . . made for the Professional!

ALL SEALANTS ARE NOT ALIKE!

Permatex tailors automotive sealants to the job . . . builds in features to match special needs of modern vehicles. You need hard *and* soft sealing . . . slow *and* fast sealing . . . *professional* sealants on which you can depend. Here they are, engineered by Permatex to do the best possible job, exactly right.

SEALANT	FORM	DRYING SPEED	SETTING	USES	FEATURES
FORM-A-GASKET NO. 1 With Special Spreader Cap	Paste	Fast	Hard	Permanent assemblies; broken gaskets and fittings; building up uneven and warped surfaces; sealing damaged thread connections; replacement of unavailable gaskets.	Withstands heat and pressures up to 5000 lbs./sq. inch, during continuous service.
FORM-A-GASKET NO. 2 With Special Spreader Cap	Paste	Slow	Pliable	For reassembly work where adjustments or disassemblies are likely. Ideal for cover plates, threaded and hose connections, and preservation of all types of solid gaskets.	Perfect seal, allows disassembly without damage even after subjection to heat, pressure and long use. For pressures up to 5000 lbs./sq. in.
AVIATION FORM-A-GASKET NO. 3	Brushable liquid	Medium	Tacky	Lubricates close-fitting parts for easy assembly, and keeps seal tight, corrosion-free, yet allows easy disassembly.	Won't run at high temperatures or become brittle at sub-zero temperatures. Resists pressures up to 5000 lbs./sq. in.
SUPER "300" FORM-A-GASKET	Brushable, heavy-bodied liquid	Slow	Firm	For assembly work on newer high compression engines and milled heads, diesel heads, cover plates and transmission housings.	Diester resistant. Resists "washing" action of detergent additives for auto lubricants and aviation jet fuels. Pressures to 6000 lbs./sq. in.
STICK-N-SEAL	Full-bodied liquid of Buna-N type synthetic rubber	Fast	Tacky	Holds gaskets or other material in place for easy assembly and eliminates "delayed action" leaks after job is done.	Combines outstanding initial tackiness with resistance to gasoline, oils, water, glycol, kerosene. Unaffected by lubricants which dissolve ordinary rubber cements.

STOCK ALL THESE PERMATEX SEALANTS . . . made for the Professional! PLUS Permatex Gasket Cement, Permatex Pipe Joint Compound. Order from your jobber today.

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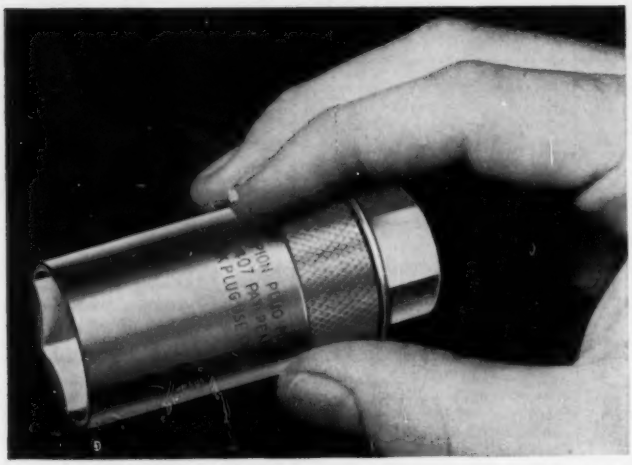
"There's a Permatex product for every maintenance need"

SEALING COMPOUNDS • POLISHES AND CLEANERS • RADIATOR PRODUCTS • SERVICE OILS AND FLUIDS • SERVICE AND REPAIR PRODUCTS

Sell-out in first 19 days proves

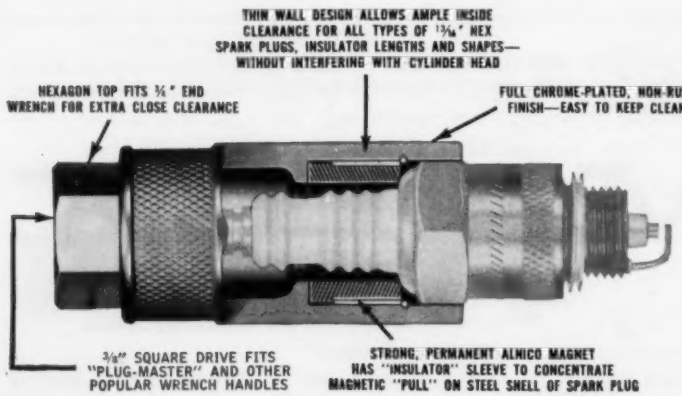
Have you seen how Champion's plugs in firm, careful grip for faster,

Developed by Champion, new "Plug-Mate" magnetic socket fits "Plug-Master" and other spark plug wrenches . . . makes plug work easier and more profitable. Available again at low introductory price of only $1.49* with a special assortment of 30 fastest-moving Champion Spark Plugs.



Even if your hands are oily or greasy, you don't have any trouble handling the "Plug-Mate" socket. Your fingers always get a sure, no-slip grip on the band of diamond-pattern knurling that only Champion offers.

The "Plug-Mate" greatly reduces danger of breaking an insulator. Its deep 13/16" hexagon-fit fully covers hex of a spark plug shell, holds plug straight, without "cocking" that leads to insulator breakage.


THIN WALL DESIGN ALLOWS AMPLE INSIDE CLEARANCE FOR ALL TYPES OF 13/16" HEX SPARK PLUGS, INSULATOR LENGTHS AND SHAPES—WITHOUT INTERFERING WITH CYLINDER HEAD
HEXAGON TOP FITS ¾" END WRENCH FOR EXTRA CLOSE CLEARANCE
FULL CHROME-PLATED, NON-RUST FINISH—EASY TO KEEP CLEAN
⅜" SQUARE DRIVE FITS "PLUG-MASTER" AND OTHER POPULAR WRENCH HANDLES
STRONG, PERMANENT ALNICO MAGNET HAS "INSULATOR" SLEEVE TO CONCENTRATE MAGNETIC "PULL" ON STEEL SHELL OF SPARK PLUG

Selling and servicing spark plugs has always been profitable. And now Champion's new "Plug-Mate" makes it faster and easier than ever! It holds plugs in a firm *magnetic* grip that speeds up plug jobs. (And that makes more profit for you!) Order "Plug-Mate" magnetic sockets for *all* your spark plug wrenches. And if those wrenches *aren't* Champion's new flex-handled "Plug-Master" wrenches—order "Plug-Masters," too. The new "Plug-Master" wrench and "Plug-Mate" socket are the greatest time-and-trouble saving team in the history of spark plug service. Order them today from your Champion supplier.

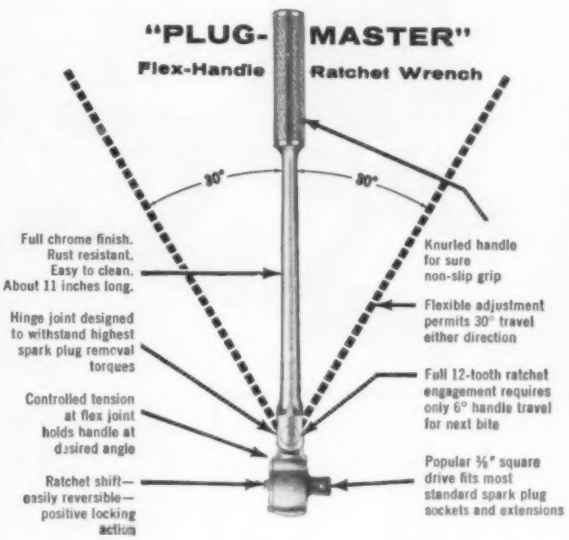
CHAMPION SPARK

"Plug-Mate" fills a real need!

new magnetic socket holds easier removal and installation?

Even when held like this the "Plug-Mate" doesn't let a plug fall out, thanks to its strong, permanent Alnico magnet. Magnetic grip makes plug removal and installation easier and faster, yet doesn't magnetize plug.

The Plug-Master Story


"PLUG-MASTER"
Flex-Handle Ratchet Wrench
30°
30°
Full chrome finish. Rust resistant. Easy to clean. About 11 inches long.
Knurled handle for sure non-slip grip
Hinge joint designed to withstand highest spark plug removal torques
Flexible adjustment permits 30° travel either direction
Controlled tension at flex joint holds handle at desired angle
Full 12-tooth ratchet engagement requires only 6° handle travel for next bite
Ratchet shift—easily reversible—positive locking action
Popular ⅜" square drive fits most standard spark plug sockets and extensions

Now acclaimed by mechanics everywhere as the outstanding wrench of its type, the "Plug-Master" is available from your wholesaler in your choice of four assortments of 50 fast-moving Champion plug types. (One for the over-all car market, others specifically selected for Ford Motor Company, General Motors, or Chrysler Corporation cars.) Packaging in these assortments enables you to obtain this new wrench at the low price of $4.95.*

*Suggested dealer price for wrench only. Assortment of 50 Champion plugs at regular dealer price. (Minimum dealer price established by Fair Trade Agreements in Fair Trade States.)

AVAILABLE WITH SPECIAL CHAMPION ASSORTMENT

The "Plug-Mate" magnetic socket, packed in a 30-plug assortment of fastest-moving Champion types to save on separate handling and delivery costs, has a low introductory price of only $1.49.* This assortment —DRS-30—contains 10 F-14Y Champions, 10 J-12Y Champions and 10 J-18Y Champions.

Suggested dealer price for socket only. Assortment of 30 Champion spark plugs at regular dealer price. (Minimum dealer price established by Fair Trade Agreement in Fair Trade States.)

Dependable 5-rib

CHAMPION

SPARK PLUGS

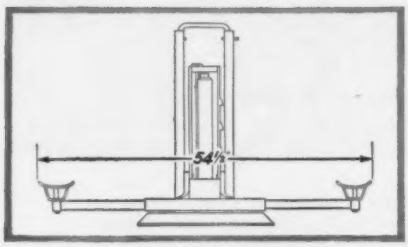
PLUG COMPANY • TOLEDO 1, OHIO

still setting the pace...

Model "55" PACER
suggested dealer price
$106.85

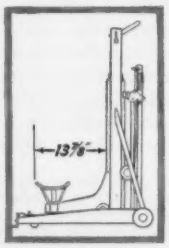
New HEIN-WERNER "55" PACER

HYDRAULIC TWIN SADDLE SERVICE JACK
It's another Hein-Werner first in advanced engineering. It's ultra-modern, designed for 1959 cars . . . more lift, more span, more reach . . . outperforms all others handles all cars even those with air suspension.



Drawing above shows giant saddle span when fully extended to 54½". Length to center line of saddles is 48". Closed length is 22½".

Drawing at right shows the 13⅞" reach of the new scooped lifting carriage which raises to a high of 31½".



Hein-Werner *sets the pace* again! The new "55" PACER has *more* of everything to speed lifting with greater ease; greater safety. It's fast acting and dependable. Raises complete front or rear end 31½ inches. New Man-sized lifting rollers turn free and easy — can't stick or bind. New scooped lifting carriage extends further beyond bumper to reach brackets, braces, pads or frame. Saddles swivel 360° for secure contact at best angle. Giant saddle span of 54½ inches reaches widest lifting surfaces. Relocated side braces improve rigidity; provide extra clearance. Heavier base members increase strength. Swivel front positioning wheel speeds spotting; is more maneuverable. Heavy duty 3 ton jack withstands severe usage; requires 12% less pumping effort to raise loads. Three automatic safety locks prevent accidental lowering. Positive controlled release valve "cushions" lowering.

Keep pace with the "55" PACER. See your Hein-Werner jobber for full details. Ask him about purchasing on convenient time payments. Remember too, that the "55" PACER is a *proven jack* because Hein-Werner manufactures and sells more hydraulic jacks than any other company in the world.

Hein-Werner CORPORATION
WAUKESHA, WISCONSIN

The complete Hein-Werner line includes: The famous "55" and "Screwball" . . . Under-Axle Jacks of 1½ to 100 ton capacity . . . "Bumper-Lift" and Ratchet Jacks for passenger cars . . . Service Jacks for shop use . . . Transmission Jacks . . . Adjustable Car Stands . . . "Push and Pull" and "Pushmaster" jacks for body, fender and frame repair work.

VOLUME XXXXVII
No. 564

Automotive Service Digest

January 1959

Cover

There's no mystery about business expansion. For some 25 years shop owners have taken advantage of the services mentioned in this month's interview . . . . page 16.

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Technical help for the service shop

Tech Know-How articles cover how-to and what's new in approved, up-to-date shop practices, as seen and understood by men experienced in the trade. *Business Know-How*, the dollar-sign side of automotive service work; *Service Education*, the who-what-where-how of today's trade training.

SYMBOLIZES A.S.D. "TECH KNOW-HOW" FEATURE ARTICLES

LEARN MORE EARN MORE
A S D
SERVICE EDUCATION

SYMBOLIZES A.S.D. "BUSINESS KNOW-HOW" ARTICLES

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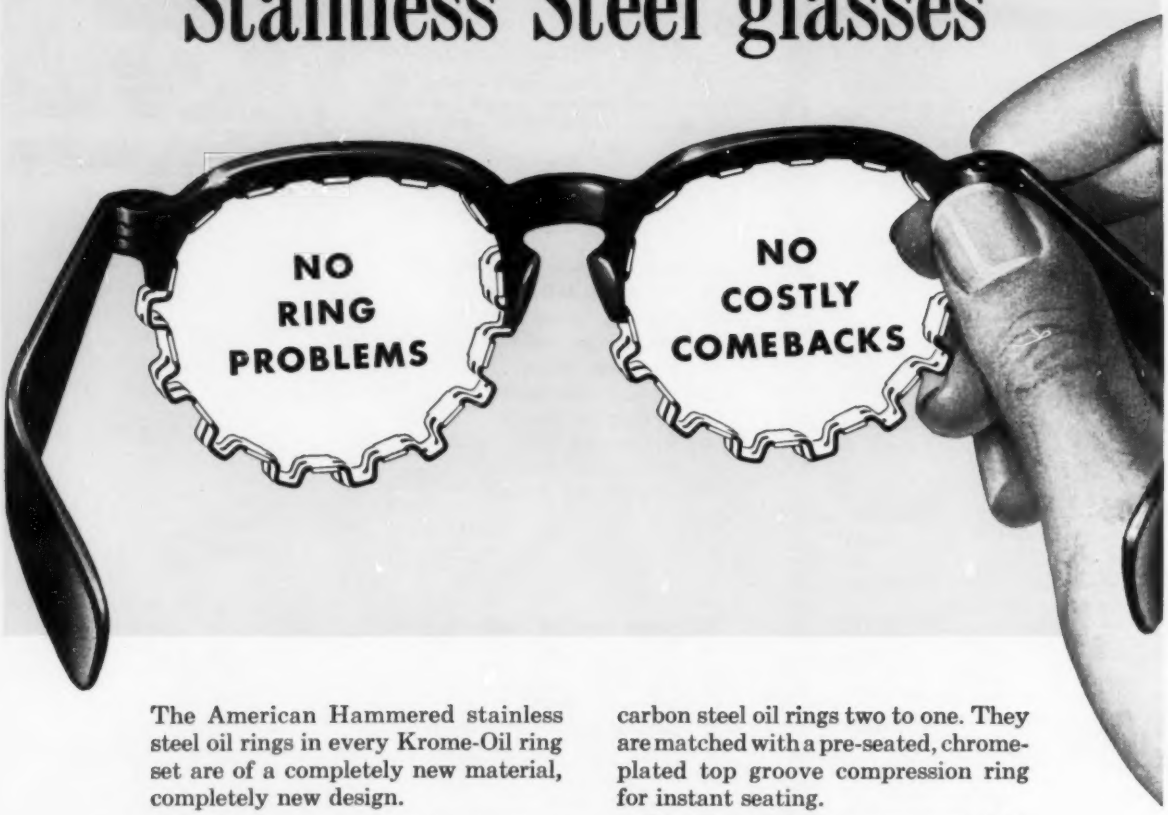
Please look at your ring jobs through these Stainless Steel glasses



The American Hammered stainless steel oil rings in every Krome-Oil ring set are of a completely new material, completely new design.

They positively control oil, eliminate smoking. They resist sludging and clogging. They retain their original, built-in tension at engine operating temperatures. They need no back-up springs. They outlast and outperform carbon steel oil rings two to one. They are matched with a pre-seated, chrome-plated top groove compression ring for instant seating.

Try Krome-Oil on your next job, new or older model. These stainless steel oil rings work in tapered or out-of-round bores. No come backs!

This oil ring is so different it is protected by U.S. Pat. No. 2,789,872.

AMERICAN HAMMERED

Automotive Replacement Division

MUSKEGON, MICHIGAN

A Division of Sealed Power Corporation

BY HERB CARRIER
Detroit Editor

Spokes from the "hub"

Superba, the long awaited Checker passenger car, is expected to hit the market some time around the first of the year. Current planning calls for production of at least 12,000 units in 1959. The car is reported to be about two feet shorter than the currently shortest U.S. made car—the Studebaker Lark.

The Superba will sport a six-cylinder, overhead-valve engine rated at approximately 140 horsepower. Selling price, including power steering, power brakes, and automatic transmission, is expected to be in the neighborhood of $2,500. (That's a nice neighborhood for the economy buyer who likes all the optional luxuries.) A very happy note to the working mechanic is the prediction that the Superba will be the easiest-to-service car in many a moon.

★ ★ ★

Good news for independents! Warranty programs whereby the independent repairmen is insured against come-backs, are being discussed. This scheme makes it possible for the owner-operator of an independent repair business to guarantee his work absolutely. If the job backfires, there is no charge to the customer for corrective surgery; and the owner-operator gets paid for doing the repeat performance. This could be a "most happy thing." We'll watch it closely.

★ ★ ★

The race is on! Heavy overtime schedules at Ford Motor and General Motors are boosting new car production far above average. Last week, an estimated 121,305 new units were built . . . the week before, 125,279. Things are beginning to roll in the city of wheels. This is good for the economy in general, and the automotive repair field in particular. It stands to reason that the more cars there are on the road the more repair and maintenance work.

★ ★ ★

Mechanic training is big! How big? Well, as a good example, during the past ten years Chrysler Corporation's Master Technicians Service Conference used 11,132 miles of 35 mm. film. If this amount of film was laid in one continuous strip it would reach from Boston, to Jacksonville, to Los Angeles, to Seattle, to Boston, and back to Seattle.

During the same period enough records for the films were produced that they could be played continuously, night and day, for 28 years and 9 months, with no time out for changing records. Enough charts were produced to carpet 113 football fields with paper, from sideline to sideline, goal line to goal line.

Next time some customer groans about the lack of training available to the auto mechanic, shoot him a few of these figures. It may open his eyes.

★ ★ ★

Ford Motor also has come out with a new series. The Galaxie has been selected as its name, and it will be priced about $52 dollars above the Fairlane 500 series. Most distinctive feature of the new entry is its Thunderbird roof. Trim-wise, the Galaxie will be the plushiest thing in the entire Ford line, except, of course, the Thunderbird itself. Service-wise, the Galaxie should pose few, if any, new problems to the service mechanic.

Aluminum is becoming more and more the magic word around Detroit Town these days. Most talked about, of course, is when to expect the first aluminum engine in a production U.S. passenger car. Pipeline sources say it is a cinch to come about . . . the question is not if, but when.

Some of the handwriting on the wall can be seen in such things as Ford's new Sheffield, Alabama, aluminum casting plant, located nearby Reynolds Metals Company's Listerhill plant. Contracts between the two call for Ford to buy **640 million** pounds of molten aluminum from Reynolds over the next ten year period.

At present, an average U.S. passenger car includes about 100 pounds of aluminum. Tying this figure to the 64 million pound agreement indicates that either FoMoCo is going to build a whale of a lot of cars in the next ten years, or (and this is where the in-the-know boys smile wisely) there's going to be a lot more aluminum used per car. Figures ??

640 million is a lot of anything, but in the case of the Ford-Reynolds deal the transaction is relatively low-cost. The thoughtful proximity of Ford's casting plant to Reynolds aluminum plant enables the metal to be transported in molten state. Elimination of casting and remelting ingots affects a considerable savings to both parties involved. Result—Ford gets the aluminum at *one cent per pound!!*

★ ★ ★

Major manufacturers are also coming up with new and different kinds of warranty programs. General Motors, for example, has instituted the "Owner Protection Policy." In essence, the purpose of this plan is to set down in writing just what are the responsibilities of the manufacturer, the dealer, and the customer who buys a new car.

Twelve maintenance coupons are included in the policy. They are meant to inform the car buyer of the regular periodic maintenance that should be performed on his automobile. Each coupon lists the servicing recommended at that particular mileage. Heading the list on every coupon will be lubrication.

The policy is not designed to force the new car buyer to return to the dealership to have his car regularly serviced. It is hoped, however, that the program will inform and educate the new car owner as to his rights and responsibilities in maintaining his automobile properly. Better care means better service, and better service means happier customers.

Automotive clinic

Stuck on some problem? Need help on a job? Write us about your problem on your shop letterhead and the information you are looking for will be promptly sent you.

Address your letter to Automotive Clinic c/o AUTOMOTIVE SERVICE DIGEST, 900 S. Wabash Ave., Chicago 5, Ill.

Ben Ikert, Editor

Hard Starting Imperial

Am having trouble with the ballast resistor on a customer's 1957 Imperial.

This car worked perfectly until it had about 6100 miles on it, and then it became "hard to start." I gave it a first class tune-up, including new points, condenser, plugs, cap rotor and new carburetor, but nothing helps.

Then I found that by putting a jumper across the terminals of the resistor the car started fine, so I installed a new resistor—in fact I have installed four resistors, but the car is still hard to start. *H.L.H., Detroit, Mich.*

Answer: In a case like this, the first thing to do is to use your voltmeter and find out what happens when the ignition switch is turned on with the cranking motor energized. The series ballast resistor used on Chrysler products has a heat coefficient so that when cold it will allow almost full current to flow through, but it quickly heats up and its resistance increases so that the ignition current voltage is cut to around 9 volts. Therefore, you should have close to 12 volts when the circuit is first closed, which will drop to around 9 or 10 volts when the cranking motor is operating. If you don't get these voltages, check the battery and all wiring for high resistance.

'49 Caddy Hard to Start

A customer of ours owns a 1949 Cadillac (32,000 miles), and for the past three weeks has been having difficulty starting the engine.

We gave the car a complete tune-up, and everything seemed fine—until a few days ago, when the customer came back in and said we had not cured the hard starting trouble.

Checking into the job, it was found that the starter was laboring hard to turn the engine at times, so we installed a new starter, checked the flywheel ring gear, and even installed a new battery . . . but still the engine was hard to start.

Tried turning the engine by hand and found that at times it was hard to turn over, and at other times it turned freely. Also noticed a vibration when engine was first accelerated to a certain speed, but this vibration would shortly disappear. The car runs perfect on the road, idles good, and is not a bit noisy.

With the help of a booster battery, the engine turns right over and starts at the touch of the button. It seems to be harder to start when the engine is hot, although at times it will not start when the engine is cold.—*F.P., Hanford, Calif.*

Answer: From your letter, it appears that some testing is in order. First, put an ammeter in series with the starter and measure the current draw of the cranking motor. This should not be over 175 amperes with a hot engine. Then, with a voltmeter across the battery, observe the drop in battery voltage after the starter has operated for 15-20 seconds. This should not drop below 5 volts. If it does, with normal ampere draw, the battery needs charging or replacement.

Using your voltmeter, check all the circuits in connection with the cranking motor for voltage drops. Anything over .1 volt should be viewed with suspicion.

It is possible that you have a loose flywheel, which would account for the vibration that comes in at times. The fact that using a booster battery makes the engine turn over satisfactorily might indicate that the trouble is either electrical, or in the starting motor itself.

Another possibility is a defective starting relay. On a 9-year-old car, contacts could be burned or dirty.

WHEN CHANGING YOUR ADDRESS

Please notify us 5 weeks in advance. Supply us with both your old and new address, including address label from current issue if possible. Copies we mail to your old address will not be delivered by the Post Office unless you pay them extra postage. **Mail address changes to Circulation Dept., Automotive Service Digest, 900 South Wabash Ave., Chicago 5, Ill.**

High Altitude Operation

I am working in a shop which is at an altitude of 5,000 ft., and having never worked in high altitudes before I am running into problems on tune-up jobs; especially on ignition timing and setting carburetors correctly.

Also, could you tell me what the compression and horsepower loss is at 5,000 ft., and if there is a set formula on this. *L.O.H., Floriston, Calif.*

Answer: At an altitude of 5,000 ft., the standard barometer reading, which is 29.92 inches of mercury (in. Hg) becomes approximately 25½ in.Hg. This means that with standard carburetor jets designed for engine operation at altitudes of under 1,000 ft., the mixture of fuel and air will run about 18% rich. Therefore, the procedure on cars which will be running at high altitudes most of the time, is to put in "mountain jets" which are smaller and designed to maintain approximately the right mixture under high altitude operation.

If you use a combustion analyzer, get the correct specifications from the manufacturer, though the mixture proportions should be approximately the same as at lower altitudes with the correct jets. The throttle will have to be opened wider for the same powerout.

If the car is to be used exclusively at high altitudes and not driven into lower altitudes, the spark can be advanced slightly over the factory specs, say about 4°. The carburetor idle adjustment will be made in the same way as usual, and fuel pump pressure should be according to factory specs.

Some cars have larger axle ratios for high altitude driving to help compensate for smaller power output; that is, between 4:1 and 5:1, instead of the current 3:1 to 4:1.

(Continued on page 10)

These **MoPar** "medicines" mean healthier profits for you!

For the life of the engines in your customers' cars—here's exactly what the doctor ordered! It's the full treatment of Chrysler-engineered MoPar engine care materials.

These MoPar "tonics" help keep engines operating smoothly, efficiently, economically. This means satisfied, repeat customers, increased sales and profits for you.

Extra engine care is especially important in cold weather. Stock up on these items now. Call your MoPar Wholesaler or a Plymouth, Dodge, De Soto, Chrysler or Imperial Dealer today.

→ **Manifold Heat Control Valve Solvent.** Designed to keep manifold heat control valve operating freely at all times. *Part No. 1879 318 (8 oz. can)*

→ **Crankcase Detergent and Rust Inhibitor.** Breaks up gum and carbon deposits, cleans hydraulic valve lifters and rings. *Part No. 1643 271 (16 oz. can)*

↑ **Engine Oil Supplement.** Provides special protection during initial break-in period of new and rebuilt engines. *Part No. 1879 406 (1 qt. can)*

← **Fuel Detergent and Upper Cylinder Rust Inhibitor.** Fights rust, lubricates upper cylinders, aids fast starting in cold weather. *Part No. 1643 272 (6 oz. can)*

→ **Carburetor and Upper Cylinder Cleaner.** Purges excessive carbon deposits from the combustion chamber without removal of cylinder head. *Part No. 1643 273 (16 oz. can)*

Sell the line that keeps your customers sold on *you*—MoPar

BE SURE TO VISIT THE MOPAR BOOTH AT THE CHICAGO AUTO SHOW, JAN. 17-25

Automotive Clinic . . .

(Continued from page 8)

Brake Grabbing

We have a case that stumps us. It concerns a Mercury 1957 Station Wagon with 45,000 miles on it. It is a case of periodic brake grabbing, pulling car to left. Have checked brake linings, wheel cylinders, pistons, knee action anchors, etc. Car was tested warm and cold, on straightaway and curves. It runs ok for some time. But recently owner, driving 9 miles developed above trouble. The next day on the same drive, car was ok, driving the opposite direction as night before. The car load and temperature were the same on both trips and highway was dry.

I am a regular reader of your Auto Clinic and will appreciate any tips.—*S.R.B., Lanark, Illinois.*

Answer: Since the brake trouble is intermittent and no indication of trouble appeared on examination it is possible that there is some occasional obstruction in either the front or rear brake fluid lines on the right side, since the car pulls to the left. You state that the brake grabs, but we think that it is more likely that one or both brakes on one side may not act, so that with the brakes on the other side of the car acting normally the car would pull to one side. We suggest replacing the brake flexible lines on the right side and thoroughly flushing the brake system with alcohol and then clean brake fluid. You might also check the springs that separate the two pistons in the right brake cylinders. If these springs are weak or possibly broken, it could cause the action you describe.

We presume you checked the linings carefully for brake fluid or grease that may have gotten on the lining.

The Model 429 Portable Tune-Up Set gives you big garage equipment with minimum investment . . . only $10.95 a month on Commercial Credit payment plan. It's self-supporting from the day of delivery!

Rugged metal case with convenient lead compartments, holds testers firmly locked in place, yet readily removable for individual use.

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Effects Neighborhood TV's

Have a problem with a 1955 Olds. 88 that I have not been able to solve. This car runs perfect, but all at once it has begun to ruin all the tv pictures within two blocks, every time it is started or as it is driven on the street. Have replaced all the high tension cables, plugs, points, condenser, also the coil resistor; but nothing has helped. The radio in the car does not pick up any of the noise. The car not only makes a noise in tv, but distorts the picture so badly it cannot be seen. Please advise what the trouble is.—*H.C.M., Lake Providence, La.*

Answer: The electrical disturbance that bothers tv sets appears to be caused by high resistance in the high tension or secondary ignition circuit. We suggest that the high tension circuit be checked with an automotive oscilloscope, which will tell definitely whether or not the trouble is in the ignition system.

High resistance in the secondary will require that the coil output voltage be stepped up to overcome the resistance. This could mean building up its voltage to well over 20,000 volts. Correcting the high resistance should bring the operation of the ignition system back to normal, if the trouble lies there and which we believe to be the case.

Voltage Drop Tests

Being a subscriber to the DIGEST I would like to know if you can recommend literature that would help me on voltage drop tests. I would like more information on testing the ignition and starting system.—*C.R.C., Bechtelsville, Penna.*

Answer: Voltage drop tests are among the simplest to make. All you have to do is to touch the voltmeter leads to any two parts of a circuit in which electric current is flowing, and you will get the voltage difference or voltage drop between the two points contacted. Thus, if you want to get the battery voltage drop while the start-

ing motor is operating, connect the voltmeter leads to the two posts of the battery observing the correct polarity so the meter reads up scale. To get the drop in the ignition system up to the coil or the ballast resistor (on 12-volt systems), connect one lead to the battery side of the coil with ballast resistor and other to the hot side of the battery, with ignition current tu ned on and points closed. Then get the drop across the ballast resistor by connecting one voltmeter lead to the battery side and the other, to the coil side. When trying to check small voltage differences, have the instrument set at the lowest voltage scale, 0 to 2, or 0 to 3, etc.

Resistors for 12-Volts

We have been having some calls for a resistor to reduce 12-volts to 6-volts. The purpose of this resistor is to reduce the voltage so that 6-volt accessories may be used with 12-volt systems. We do not know if any such resistor is made. Can you give us any information on this.—*Roy M. Smith, Payneville, Ky.*

Answer: The idea of using a resistor to reduce 12 volts to 6 volts is not practical, because with any fixed resistance, the voltage drop will vary with the amount of current flowing. For example, according to Ohm's Law (R=E/I), if you had an appliance or accessory that requires 10 amperes and wanted to reduce the voltage from 12 to 6 volts (a 6-volt drop), you would have to use a 0.6 ohm resistor. Therefore the only way you could satisfactorily use resistors to reduce the voltage would be to have a different value of resistance for each accessory or appliance. You can readily see that this would hardly be practical.

Poor Fuel Mileage

Maybe your Clinic can help. The car in question is a 1955 Mod. TW6L 6 cyl. Willys B. Wagon 4 WD and fuel-wise allows only 9 miles to a gallon. It has hubs on front wheels to change over to two-wheel drive. Has a new carburetor. Ignition timing was checked and I shimmed the fuel pump to cut down pressure; also checked float level in carburetor. Installed an injecto-flo that helped some; before the engine had to be raced or it would stall at idle; now it idles, but rough. Can I put on another type of carburetor by using adapters?—*E.M., South Middleboro, Mass.*

Answer: You have done considerable checking, but we note that you have overlooked compression. This engine is 4 years old, and in that time—especially if the truck has seen a lot of use—there could be bad valves, which would account for poor gas mileage. If you are going to dispense with the four wheel drive, we suggest you put the correct ring gear and pinion for a two wheel drive vehicle in the rear axle. Then, check the compression. The fact that you cannot get a smooth idle would point to malfunctioning valves. The carburetor is probably all right, though if you want to get somewhat better gas mileage at expense of performance, put a smaller jet in the high speed circuit. Check the dwell and voltage in the ignition system. Be sure the spark plugs are in good condition, are correctly gapped and are of the right heat range.

Rough Dynaflow Shifting

About two months ago I overhauled a customer's '55 Buick Dynaflow. After the job, it worked fine. However, we have it back in our shop with a rough shifting from low to drive. I started out by checking high accumulator pressure and found this to be from 100 to 115 psi, also stator and front pump were proportionally high. This indicated to me, to be pressure regulator. After overhauling the valve body and being very meticulous with the regulator, I still had the same condition. Could I have a leak in the reaction flange that would cause this? Or, am I overlooking something elsewhere?—*R.H.H., Salt Lake City, Utah.*

Answer: Your letter is not very clear as to the trouble. There isn't supposed to be any shifting from low to drive on the 1955 Dynaflow. The only time low is to be used is the occasional circumstances when maximum pulling

(Continued on page 71)

Herbrand — TOOL-OF-THE-MONTH

J-42 FILLER PLUG WRENCH for servicing
'59 FORDS
and MERCURYS

SPEEDS — EASES REMOVAL OF DIFFERENTIAL HEX FILLER PLUG

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Look for this Skin-Pack display on your Jobber's wall or counter. It's your reminder that you need the Herbrand J-42. If you don't see it, ask your Jobber.

The first Herbrand tool-of-the-month for the New Year was designed to fill an urgent need—a tool that would remove the Hex Filler Plug from the differential of a '59 Ford or Mercury. Using the J-42 and a ratchet, the mechanic can quickly remove and replace this hard-to-get at plug. With its 3½" length and ⅝" hex and drive ends, the J-42 is just right for the job—a welcome addition to Herbrand's growing family of special tools for special requirements.

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Now! A CARTER ***Clean-out Kit!***

Genuine original equipment parts for the most popular Carter carburetors—

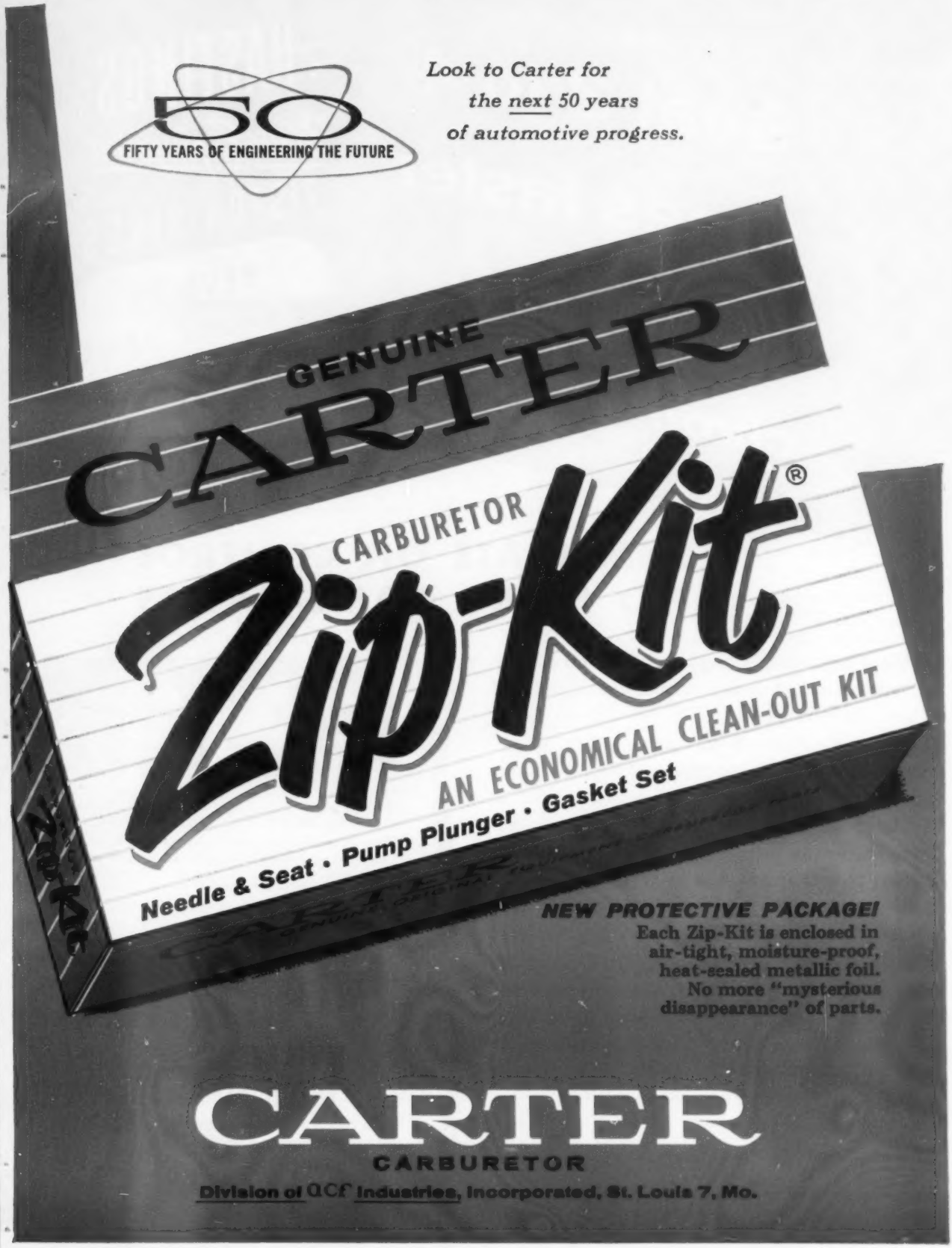
Sensationally Low Price!

This year CARTER enters its *second* 50 years of service to the automotive industry with the introduction of a new, *sensationally low priced* ZIP-KIT®—an economical, easy-to-use carburetor clean-out kit comprised of genuine *original equipment parts.* Now mechanics everywhere can specify and install *precision* carburetor parts made by the same manufacturer whose carburetors are on 24 million cars today!

With CARTER's Zip-Kit you'll always be ready for fast, *dependable* clean-out jobs—and at a tremendous per-kit saving! In fact, the new Zip-Kits are priced so that you never again will even *consider* using other than genuine, original equipment parts!

Accept no substitute. Demand the best . . . CARTER. And remember, your future's fine in '59—with CARTER!

Call your supplier *now!*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Look to Carter for
the next 50 years
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Zip-Kit®
AN ECONOMICAL CLEAN-OUT KIT
Needle & Seat • Pump Plunger • Gasket Set
NEW PROTECTIVE PACKAGE!
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• IMMEDIATE OIL CONTROL
• NO MORE COME-BACKS

● Want faster seating ring jobs? Want oil control in tapered, out-of-round or re-bored cylinders? Then you need Hastings Chrome-Vent oil rings. They seat 3 to 4 times faster than any other chrome rings made. They assure positive oil control right now. They eliminate profit-cutting come-backs.

The Hastings patented *beveled chrome* rail makes *immediate fineline contact* with the cylinder wall. It has less contact area to wear-in—takes less time to break-in.

Chrome-Vent gives at least 3 times greater chrome wearing surface, too—because the thick chrome cap extends *around* the bevel. And, with the lighter inner-spring made possible by the beveled design, it makes gentle, soft-pressure contact with any cylinder wall.

Always use Hastings, the product of replacement specialists. You'll be sure of a good profitable ring job and a satisfied customer, too.

BEVELED CHROME-VENT
Rails make fineline contact with cylinder wall for a faster seat. Less area to wear-in means less time to break-in.

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on oil-pumping

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Piston Rings, Oil Filters, Casite, Spark Plugs
Hastings Rings are covered by
U. S. Patent Nos. 2148997, 2511874, 2565042, 2712971

Editor's page

It pays to face the facts

● THERE'S PROBABLY NO greater inherent quality of good shop management than undertaking only those things you can do something about; those instrumental in building up the profit side of the ledger.

Another way of exercising this attribute of good business is to forget the things about which you cannot do anything, that is, for the time being, at least.

The chances are you have competition down the street which is rendering service of some kind that you are not in position to do at the moment—maybe shouldn't try to do anyway. You may be confronted with one of those things which in business vernacular you're better off to just "let it ride."

It brings to mind a story they tell about a big landslide of some kind that was occurring or about to occur at one time in the Pittsburgh area. The source of the story is not recalled, but with due acknowledgement to its author, here's the general drift.

Seems like this landslide had the city fathers and many inhabitants quite worried, particularly so since not even engineers and construction folks had a ready solution as to what should or should not be done.

Came the dawn and a bright idea! They would ask an outstanding civil engineer to come to the scene, size up the great landslide and give his answer as to what should be done. So, none other than General George W. Goethals, who finished the Panama Canal construction, was engaged to come to the scene.

The day of General Goethals' visit came and the entourage to the site included the city's engineering and governmental celebrities, who breathlessly awaited the celebrated engineer's analysis and verdict.

After casually looking over the threatened area for a few minutes, General Goethals literally stunned his expectant listeners with this simple statement: "I see only one thing to do—let it slide."

A sane, logical answer, coming from a man who had to size up many comparable situations and come up with the right answer.

Shopmen when faced with old or new problems, and having assured themselves that nothing can be done about them, might well follow General Goethals' example and just let 'em slide. To do so conserves time and manpower—otherwise wasted—and permits concentration on things something **can** be done about.

Ben Ikert
EDITOR

How do service shops expand?

Interview *

By BEN M. IKERT
and
GEORGE A. WHITTINGTON

WALTER Y. RAHN, Vice President of Commercial Credit Corporation, has been associated with the automotive business since 1912. He joined the firm that year and has been with it since, save for an 18-month period in 1919-21, when he helped to found and conduct a financing company in New York City. When Commercial Credit established its national organization in 1924, Rahn was sent to Cleveland in charge of all Ohio operations. He was moved to St. Louis as Sales Manager for a year, then returned to Chicago as Secretary of the firm in 1927. Since that time he has been in charge of western factory relations.

• WATCHING THE CARS ROLL BY out of a service shop doorway can be a pleasant—or very bitter—experience. When they're new cars just off the dealer's floor, automotive shop men can feel a glow of satisfaction. For every additional car on the road is a promise of service business opportunity to come.

When, however, the cars that roll by are those being serviced somewhere else, the shop owner had better ask himself, "Why not here?"

With automotive servicing booming and due to do so for years to come, why do some shops have difficulty "making ends meet"—let alone showing a fair profit? In many cases, it's because the owners aren't keeping pace with their field itself. Although 1958 was a record year in sales of automotive shop equipment, more than a few shops failed to expand their facilities and staff in order to handle more business.

WHAT'S THE PROBLEM?

We turned for some straight answers to a financing firm that has worked closely with the automotive industry for almost half a century. Commercial Credit Corporation entered the financing of new car purchases in 1916—supplying the link between mass production and mass buying of automobiles.

In 1934, Commercial Credit developed an industry plan for financing the purchase of automotive shop equipment, which was accepted and sponsored by NSPA and other leading trade groups. Since that time, the firm has worked in the forefront of the sweeping expansion of the service field.

Vice President Walter Y. Rahn, who has been "immersed" in this activity since its beginning, draws on a wealth of experience to answer some fundamental questions about shop expansion.

* * *

Question: Is there some rule of thumb that a shop owner can use as a guide in deciding when to start thinking seriously about borrowing money for expansion?

Answer: The slogan "The best equipped Shop gets the Business" is most important to the service industry because of the continuous expansion we can look forward to in the automotive industry. There is no excuse for every shop not being modern and up-to-date with the best equipment to do the finest service job.

Q: Assuming that an automotive service shop is soundly managed, what would you estimate to be the risk the owner takes when he "borrows against future earnings" for expansion?

A: The automotive service shop cannot be soundly managed without the proper tools to do the job. It is just a plain case of shortsightedness if the necessary equipment is not acquired, particularly when such equipment will pay for itself within a short period of time.

*One of a continuing ASD feature series.

Q: If a shop borrows in anticipation of increased business and the expected larger volume of work does not materialize, how can the owner best meet the situation?

A: The acquisition of modern equipment will not in itself increase business. A thorough knowledge of its many uses, experienced mechanics and fair dealing with the car owner, are basic ingredients for increased business and profits.

Q: What are the major sources of funds for financing automotive service shop expansion, and how do they differ? What are the advantages of each?

A: Capital for financing automotive service shop expansion cannot always be obtained from banks or lending institutions. Fortunately, there has been available for more than 20 years, what is known as the Automotive Equipment Industry Finance Plan, which was developed by Commercial Credit Corporation and is offered by most equipment manufacturers and jobbers throughout the United States and Canada. The funds available for this purpose are unlimited.

Q: Should the shop owner "shop" for the best terms for borrowing expansion funds? Why?

A: Cost of borrowing money, when it's needed for necessary expansion, is secondary in relation to the added profit such expansion allows. A key fundamental in the acquisition of modern equipment is that it be profit producing and labor saving.

In cases where a business does not have available capital with which to carry on its trade, it should be reminded that the highest price any business man can pay for money is the price he pays for the lack of it.

Q: From your contacts in the field, can you provide statistics on the financing of shop purchases? How many and what kinds of shops borrow for the purpose, and where do they turn for funds?

A: Most modern shop equipment performs certain definite functions, specific jobs in which there are known profit margins. When the cost of the equipment is related to the daily job profits it produces, the acquisition of the equipment can be made to pay for itself automatically.

The manufacturer or jobber who does not offer reasonable terms in the sale of equipment, is not helping the industry. The fact is that virtually every automotive jobber offers installment purchasing, indicating the use of such a plan by most shops.

Q: In your opinion, what determines the most advantageous arrangement for shop expansion?

A: In my opinion the most advantageous financing arrangement is Commercial Credit Corporation's Automotive Equipment Industry Finance Plan, which is available through most jobbers.

This plan permits a down payment as low as 10 per cent and maturities up to 36 months. The shop owner is protected by life insurance, and the equipment is covered with property insurance.

Q: Generally speaking, how does an automotive service shop qualify for a business-expansion type of financing . . . what conditions must it meet . . . what information must it provide?

A: I do not know exactly what yardstick the various banks use for a business-expansion type of loan. I can only offer what we consider basic in the extension of installment credit. First we check the moral aspect. Of second importance is whether the applicant has an established place of business. Third —the record for paying bills. Fourth, we want to determine that the shop is doing a profitable business; and fifth, what are the prospects of its staying in business (we try to measure this for the term of the installment transaction).

Q: When an automotive shop has borrowed money for expansion, is the owner then limited to any extent in his "free hand" in running the business? If so, in what way?

A: This question can be answered "yes and no." Some banks urge a limit on expansion within the maximum loan permitted or the working capital on hand. Other banks will increase the amount of the loan from time to time so long as the shop is doing a profitable business.

Q: From your experience, what can you tell us about the outcome of the general run of installment purchases by automotive service shops?

A: Our records show that less than 1 per cent of approved contracts result in repossession—which is a splendid record for any field!

Q: When a shop owner expands his facilities are there any key provisions he should look for, or insist upon in financing contracts?

A: One beneficial provision—which is included in all our contracts—is a standard schedule of refund for anticipation payment. Any shop buying equipment on installments can pay off the total balance at any time—and, of course, save on the financing costs by doing so.

Q: Do banks and lending institutions offer help to shop owners in determining their needs and qualifications for expansion funds?

A: In many cities, the local bank or banks do an excellent job in helping shop owners. In other cities, local banks show no interest whatever.

Q: Can you recommend a step-by-step procedure to be followed by the automotive service shop owner who has decided upon expansion? How can he check his business judgment . . . decide between his personal feelings and varying advice?

A: If the service shop owner needs to purchase a building or lease more space for expansion purposes, he discusses his problem thoroughly with his local bank. If he needs additional service equipment, he should explain this problem to his automotive jobber or manufacturer's representative.

The Carter AFB Carburetor

Carburetor work requires familiarity with the five lines currently used on domestic cars—each car manufacturer using two or more interchangeably as a matter of policy. Here's the inside story on the 1959 four-barrel carburetor. It's the refined, dependable heart of the modern fuel system.

By GUY F. WETZEL
Technical Editor

• AS ONE OF THE MOST MODERN of four-barrel carburetors, the Carter AFB has a number of interesting features that are well worthy of the mechanic's careful study. This is particularly true since those who do carburetor work will run into the AFB on at least 10 cars of the 1957-59 model years.

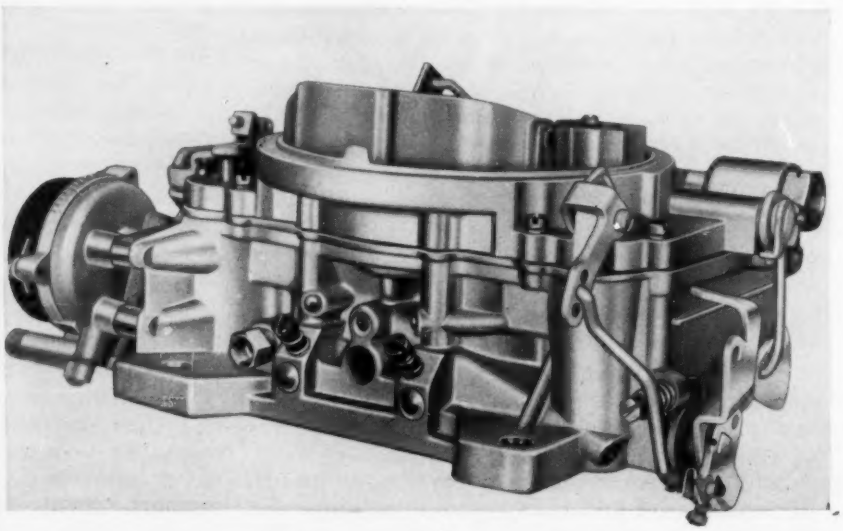
On this unit, all major castings are of light, durable aluminum; and overall height has been considerably reduced in line with the tendency toward lower hoods year-by-year. Five conventional circuits—as used in previous models and generally incorporated in major American makes—are found in the AFB. These are: (1) two float circuits; (2) two low-speed circuits; (3) two high-speed circuits; (4) one pump circuit; (5) one choke circuit.

The step-up rods or metering pins, pistons, and springs are accessible for servicing without removing the bowl cover from the carburetor or the carburetor from the engine—which is definitely advantageous. Replaceable venturi clusters contain a number of calibration points for both the high- and low-speed circuits, and some models also have a built-in dashpot or slow-closing throttle device.

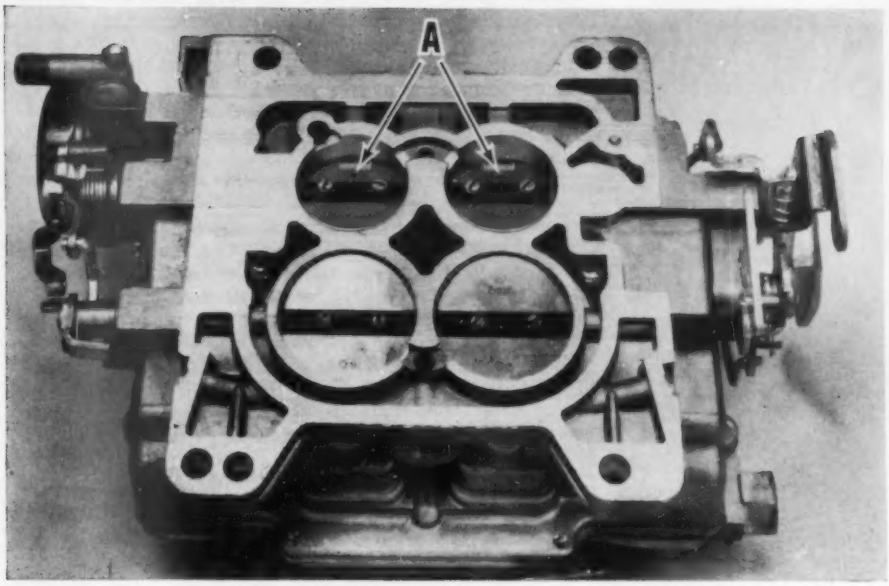
This four barrel downdraft carburetor incorporates primary and secondary fuel metering sections. The primary section contains the low-speed (idle) system, high-speed system, choke, accelerating system, metering rods, and dashpot assembly. The secondary section, which contains a high-speed system, is basically a supplementary carburetor that provides increased breathing during high-speed operation.

FLOAT SYSTEM

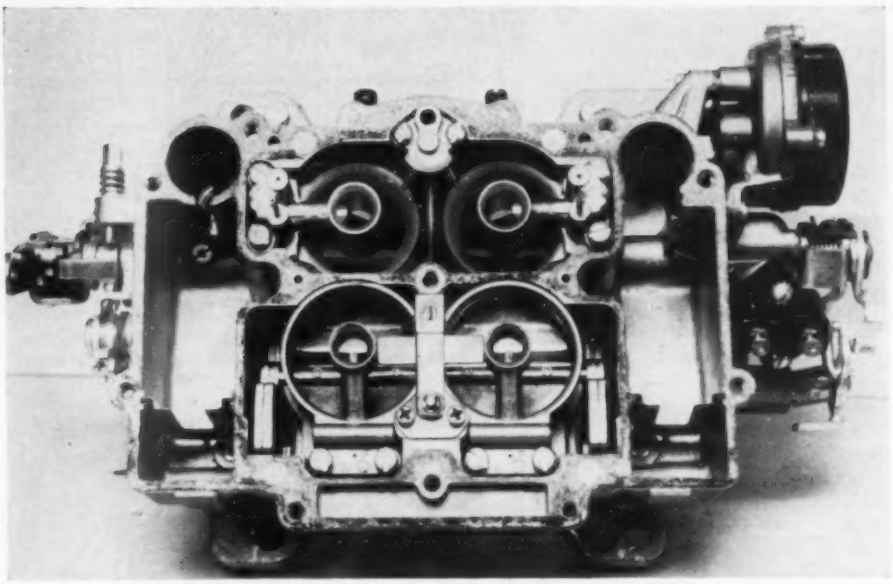
It is the purpose of the float system to maintain an adequate supply of fuel at the proper level in the bowls, for use by the low-speed, high-speed, and pump circuits. There are two separate float systems to direct fuel into the two float bowls, located one at the left and one at the right side of the carburetor. Each float bowl contains a float and a needle-and-seat assembly. Each bowl supplies fuel to a primary metering jet and a secondary metering jet, thus serving both the primary and the secondary.



Front view of the AFB Carter carburetor, showing its compact low structure. The idle mixture adjusting screws are conveniently located.



Sectional view of AFB carburetor, just above the throttle plates. The plates at the front are the secondary, and those in the rear, the primary. Note the holes (A) in the primary throttle plates, as used in the 1959 Pontiac, and supplying additional idle air to supplement air from by-pass circuit.



AFB carburetor, showing the small aluminum venturi baffles inside the small venturi in the primary side of the Buick carburetor. These aid distribution of the fuel-air mixture in the intake manifold. Note the counterweights that balance the auxiliary throttle valves or plates, shown at each side of the secondary barrels.

Intake needle seats are installed at an angle, to assure positive seating of the needles by the action of the float assemblies. A fuel bowl baffle is installed in each bowl, to prevent excessive fuel aeration, agitation or surging, and assure an adequate and uniform fuel supply for both the primary and secondary main jets. A standpipe is provided at each needle seat as an additional trap for foreign material that might prevent the valve from seating properly.

All fuel enters the carburetor through a common inlet in the air horn. Fuel is directed through a passage in the horn to the right and left fuel inlet needle valves. Fuel level in the float bowl is controlled by the action of the float as it governs the opening and closing of the float needle valves.

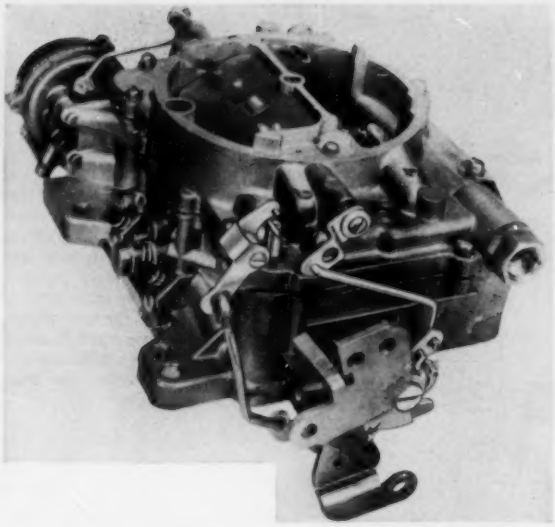
Setting the floats to specifications is important; as it assures an adequate supply of fuel in the bowls for all operating conditions, by maintaining the correct fuel level. Be sure the floats do not bind in their hinge brackets or drag against the inner walls of the bowl.

The bowls are vented to the inside of the air horn, and on certain models also to atmosphere. A connecting vent passage provides a balance between the two bowls, so that if one should become flooded because of improper sealing of the fuel inlet needle valve, excess fuel can drain through the balance passage and thus minimize the flooding effect.

Gasket surfaces of the carburetor casting must be free of nicks or burrs to assure a positive seal. An air or fuel leak at these points can result in poor mileage and cutting-out on sharp turns or sudden stops. A new air horn gasket should be used when reassembling.

LOW SPEED CIRCUIT

Fuel for idle and early part-throttle operation is metered through the low speed, or idle circuit, which is located on the primary side only. When the primary throttle plates are in closed or idle position, manifold



End view of the AFB carburetor, showing the choke, fast idle linkage and the accelerating pump linkage.

vacuum causes fuel to enter the idle wells through the main metering jets. The low speed jets meter the amount of fuel; which passes through the low speed jet, past the economizer into the idle passages in the carburetor body. Air enters the bypass and air bleeds to mix with liquid fuel and break it up into a combustible mixture.

The air-fuel mixture discharges at the idle discharge ports and the idle mixture adjusting screw ports, into the carburetor throat. As the throttle plates are opened, the slot-shaped idle ports are uncovered, allowing a greater quantity of fuel-air mixture to enter the carburetor bores. The secondary throttle plates remain closed at idle. Turning the idle adjustment screws toward their seats reduces the quantity of fuel mixture supplied by the idle circuit.

The low speed jet, air bleed, economizer and by-pass bushings are pressed into place. They are *not* to be removed in servicing. If replacement is required, install a new venturi assembly. Air leakage at the gasketed surface surrounding the low speed mixture passages or between the flange and manifold, may cause poor idle and low-speed operation. In such cases, tighten venturi assemblies securely. Always use new gaskets. To assist in quick, hot-engine starting on some models, fuel vapor accumulated in the primary and secondary bores is vented to atmosphere through vent passages above the throttle valves.

HIGH SPEED CIRCUIT

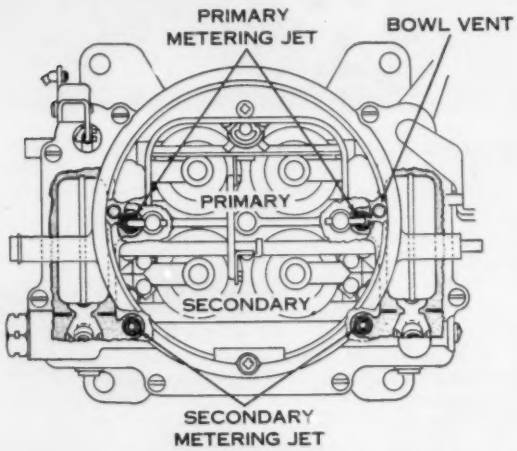
Fuel for part throttle and full throttle operation is supplied throught the high-speed systems, which consist of the primary side and the secondary side.

On the primary side—As the throttle plates are opened, manifold vacuum at the idle ports drops, diminishing the air-fuel flow through the idle system. However, air flow through the venturi increases to a point where venturi vacuum causes fuel to flow from the high-speed nozzles. The amount of fuel delivered by the high-speed circuit is controlled by air flow or throttle plate opening, and by the position of the metering rods in the main metering jets. The position of the metering rod is controlled by the manifold vacuum applied to the vacuum piston.

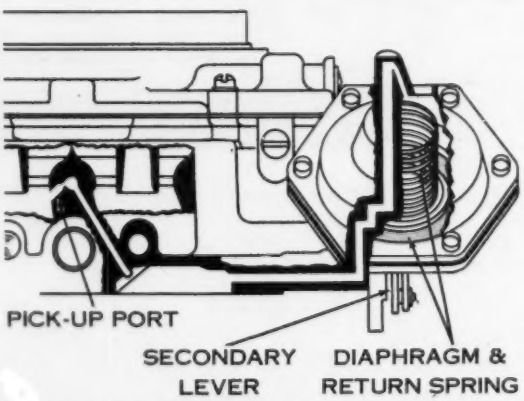
During part-throttle operation, manifold vacuum pulls the piston and rod assembly down against the vacuum piston spring tension, and the large diameter of the metering rod is held in the primary metering jet. Fuel is then metered around the rod in the jet. This is true at all times when the vacuum under the piston is strong enough to overcome the tension of the vacuum piston spring. When the manifold vacuum has decreased, due to acceleration or wide-open-throttle operation, the tension of the spring overcomes the pull of the vacuum under the piston and the metering rod moves up so that its smaller diameter or power step, is in the jet.

As the vacuum existing in the primary venturi draws fuel from the primary metering jet and main well up to the high speed nozzle, the fuel is drawn through the main well tube, which is pressed into the primary venturi. The fuel is mixed with air entering the vent tube through the primary venturi high speed air bleed. The fuel-air mixture is then discharged out the high speed nozzle.

The high-speed bleed also acts as an anti-percolator vent when a hot engine is stopped or idled. This helps to vent fuel vapor pressure in the high-speed and idle well



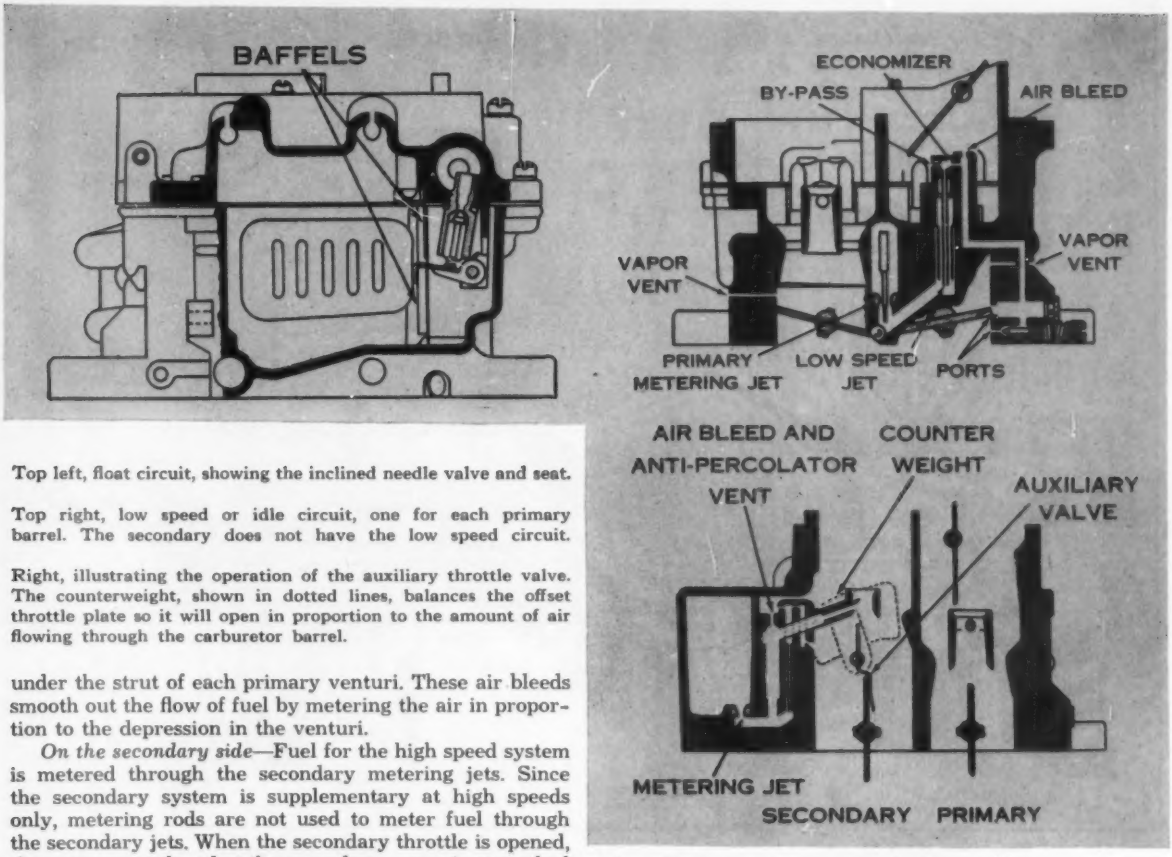
Shown above are the primary and secondary metering jets. The primary jets vary in size by means of the metering rod, while the secondary jets are fixed.



Vacuum operated secondary, governed by the vacuum at the primary venturi. When this reaches high enough vacuum to overcome the diaphragm spring, due to the volume air flowing through the primary, the secondary throttle valves start to open.

before it can push fuel out of the nozzles and into the intake manifold.

An air bleed from the venturi of the carburetor to the interior of the main discharge nozzle passage is located



Top left, float circuit, showing the inclined needle valve and seat.

Top right, low speed or idle circuit, one for each primary barrel. The secondary does not have the low speed circuit.

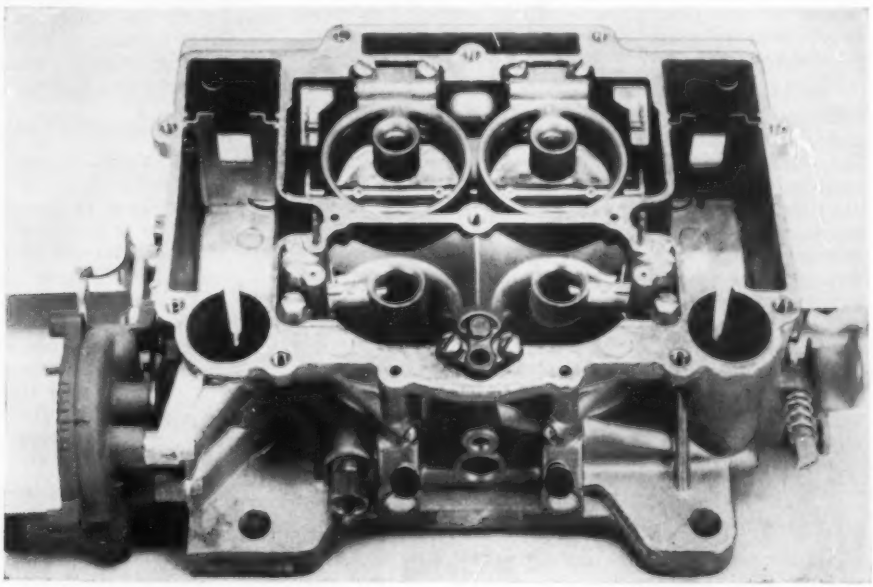
Right, illustrating the operation of the auxiliary throttle valve. The counterweight, shown in dotted lines, balances the offset throttle plate so it will open in proportion to the amount of air flowing through the carburetor barrel.

under the strut of each primary venturi. These air bleeds smooth out the flow of fuel by metering the air in proportion to the depression in the venturi.

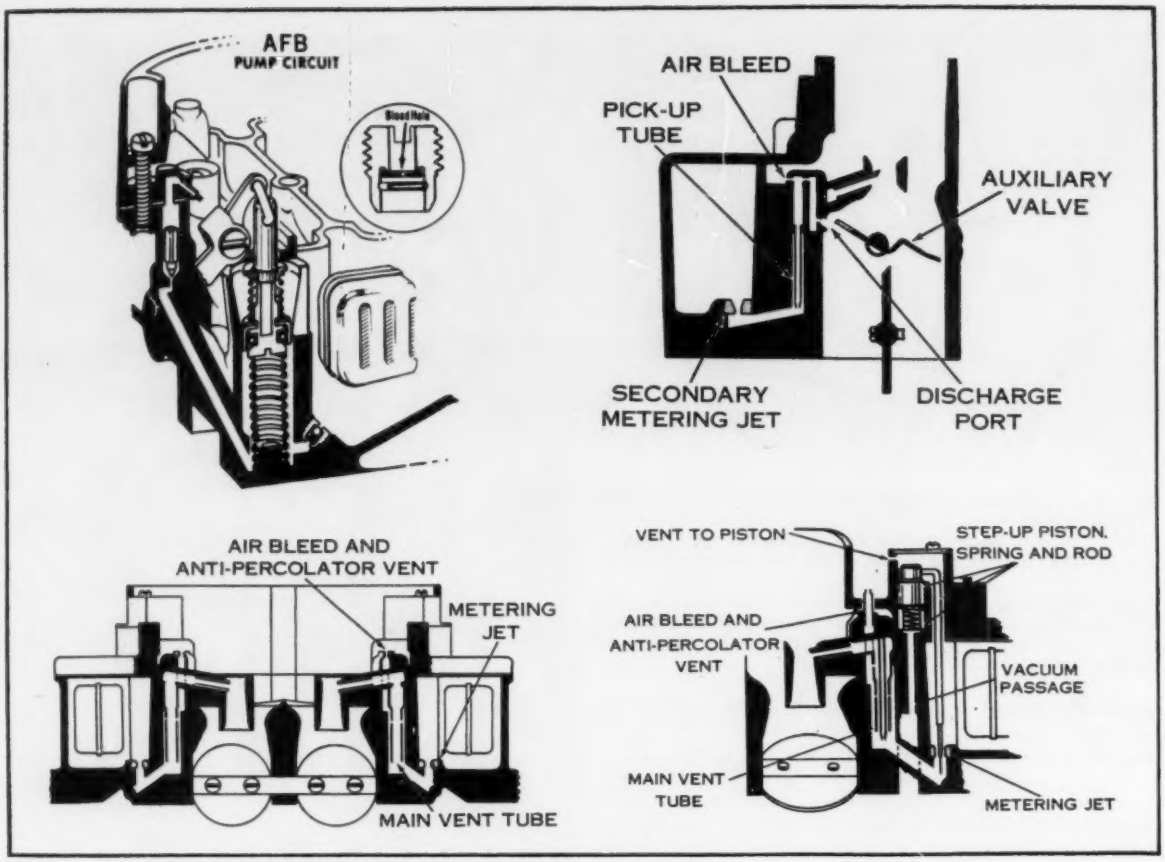
On the secondary side—Fuel for the high speed system is metered through the secondary metering jets. Since the secondary system is supplementary at high speeds only, metering rods are not used to meter fuel through the secondary jets. When the secondary throttle is opened, the vacuum produced at the secondary venturi causes fuel to be drawn through the secondary venturi main well. There it is mixed with air from the secondary venturi air bleed and discharged out of the secondary high speed nozzle.

A clogged air bleed or main vent tube may cause excessively rich mixtures. The high-speed bleed and main vent tubes are permanently installed. If replacement is necessary, use a new venturi assembly.

Auxiliary valves and initial discharge ports—These are incorporated on some models of the AFB carburetor, to assist the flow of fuel in the secondary high speed circuit. Initial discharge ports are located next to the venturi struts. When the auxiliary valves start to open, the vacuum at the discharge ports pulls fuel into the pick-up tubes. The secondary auxiliary throttle plates have



The AFB carburetor from the front, with top removed, showing float bowls, fuel supply connection, idle mixture screws and pump discharge nozzles (at the front of primary barrels).



Upper left, typical AFB pump circuit, with new location of the pump intake check valve. The insert shows the disc type of check valve that is used on the 1959 Lincoln, only. The disc bleed allows vapor to be vented from the pump circuit under heat conditions. Upper right, initial discharge circuit. This provides some flow of fuel when the auxiliary throttle valve starts to open in the secondary barrels to avoid a sudden surge of power as the secondary part of the carburetor cuts in. Lower left, the secondary high speed circuit. Note how the discharge nozzle is located to discharge into the throat of the small venturi on each side. Lower right, the primary high speed circuit. Note the stepped metering pin or rod and the vacuum cylinder and piston which operate it.

counterweights on the ends of the auxiliary throttle plate shaft, which operate in a recess inside the carburetor body. Throttle plates in the secondary side remain closed until the primary throttle plates have been opened a predetermined amount. If the accelerator is fully depressed, the secondary throttle plates are opened a few degrees through linkage with the primary throttle. Air velocity through the carburetor controls the position of the auxiliary throttle plates, opening them when the force of the air against the offset plates, is able to lift the counterweights.

With the accelerator fully depressed, only the primary high speed system will function until there is sufficient velocity of the air to open the auxiliary plates. When these open, fuel will be supplied through the secondary system in addition to that supplied through the primary system.

SECONDARY THROTTLE VALVE OPENING DEVICES

On some AFB models, the secondary throttle valves are vacuum controlled. This feature provides the added capacity of the second carburetor only when the engine is able to make use of it.

When the accelerator is fully depressed, the secondary valves are cracked open a few degrees manually. Air passing through the primary venturi determines the amount of vacuum applied to the secondary throttle operating diaphragm, by way of the primary vacuum pick-up port. When the vacuum is strong enough to overcome the diaphragm spring, the secondary valves open. A vacuum pick-up port located in the secondary venturi, supplies vacuum to overcome the partial loss at the primary pickup port, when the secondary valves open.

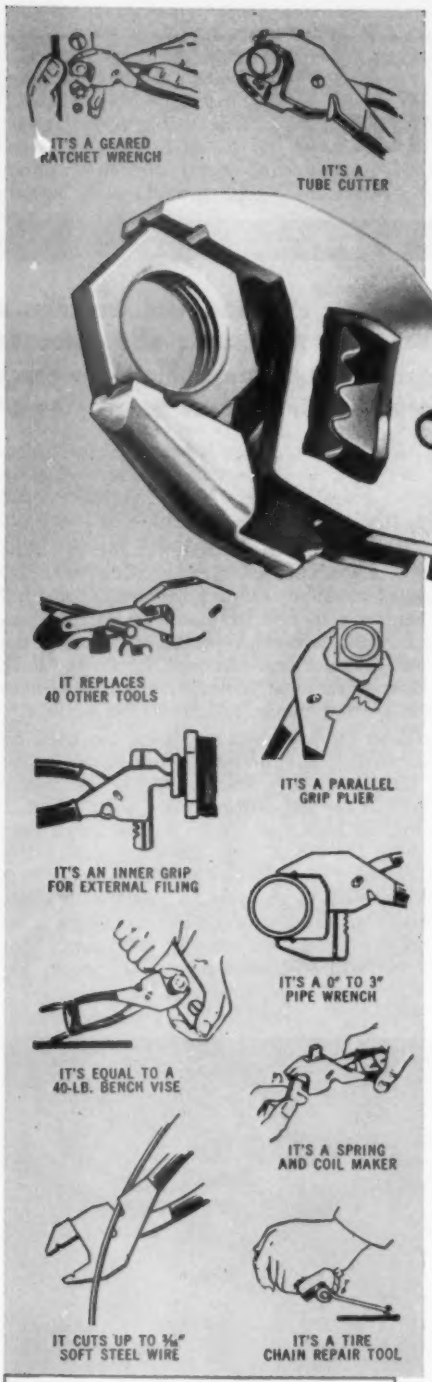
ACCELERATING PUMP CIRCUIT

The accelerating pump circuit, located in the primary side, is designed to provide the necessary amount of additional fuel to insure smooth engine operation on acceleration at lower car speeds.

When the throttle is closed, the pump plunger moves upward in its cylinder and fuel is drawn into the pump cylinder through the intake check. The discharge check is seated at this time to prevent air from being drawn into the cylinder. When the throttle is opened, the pump plunger moves downward, forcing fuel out through discharge passage, past the discharge check and out the pump jets. When the plunger moves downward, the intake check is closed, preventing fuel from being forced back into the bowl.

At higher car speeds, discharge is no longer necessary for smooth acceleration. Therefore, when the throttle on the primary side is opened about one third the pump

(Continued on page 78)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IT'S A TUBE CUTTER
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IT REPLACES 40 OTHER TOOLS
IT'S A PARALLEL GRIP PLIER
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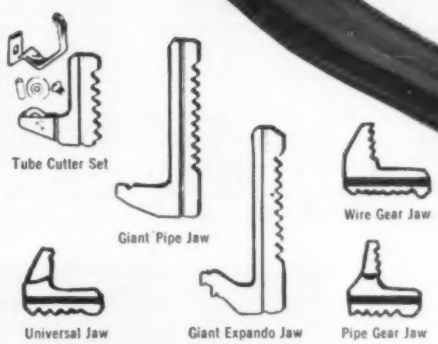

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Preparing refinish surfaces

Smooth gloss finish on a car that rolls out of a body and fender or a specialty paint shop is ideal for reflecting the sparkle of satisfaction in a happy owner's eyes. Such profitable results are within ready reach of shops that "care enough to do body refinishing at its very best."

By GUY F. WETZEL
Technical Editor

• THE LIFE OF A FINISH and its appearance, depend largely on the condition of the surface over which the paint is applied. From the painter's viewpoint, "surface" means the base upon which finish enamel or lacquer is put down—whether it be bare metal or old paint. Since the final coats of enamel or lacquer do little filling-in of uneven or rough areas, the finished job can be no smoother than the base beneath it.

To get this base in the condition that permits a "first class," smooth finish requires proper filling and puttying, followed by suitable sanding. Automotive service shop painters, in body and fender or repainting specialty shops, have two conditions to work with, often on the same vehicle. Finish is built up over bare metal, or over paint that was applied previously.

BARE METAL SURFACES

When finishing over bare metal, it is quite essential that a good rust solvent and cleaner is used to take off grease, perspiration or oxidation—so that the first coat of finishing material will have maximum adhesion. The prime requisite of a good paint job is smooth metal. Except in the case of complete refinishing, the reason that repainting is required is usually that metal work has been done. This means that the metal man has used the disc sander on the surface. Generally, fairly deep scratches are left, since most metal men use abrasives that cut fast but are too coarse to smooth the surface.

Further, careless filing or bearing down too hard on the coarse abrasive disc, cut furrows in the metal, which are difficult to fill. The best practice is to use the coarse disc for roughing out the job, cutting down weld joints or spots and levelling off high spots; then do the major part of the s[illegible]ith the No. 24 disc, finishing with a No. 50 or N[illegible]asive disc. Even when this is done, it is advisable [illegible] the painter to go over the metal with a No. 150 paper to flatten out the remaining burrs. (There is no danger of getting the surface too smooth; even metal that looks quite smooth will still have plenty of "tooth" for the primer.)

Fig. 1. The first step in preparing the surface, where metal work is done, is to go over it with the disc sander. The final surfacing with the power sander should be with an abrasive not coarser than No. 50 to No. 80. Coarser than this will leave deep scratches which will be difficult to remove without excessive puttying.

Some painters may not realize the importance of having the steel absolutely clean before applying undercoats. It is fairly common practice to rub a hand over the area being worked on to determine the effect of the sanding. However, this habit transfers oil from the hand to the surface, even if the hands have been freshly washed, a fine oily film will be left on the metal. (If there is any doubt about this, try to take hold of the lenses of eye glasses, or a clean drinking glass and not leave finger prints on the surface.)

CLEAN THE SURFACE

On the steel of auto body, hood, door or fender the finger prints may not be visible; but they are there just the same. Therefore, wiping over the surface with the wax and grease solvent is good insurance against peeling. In addition it is highly advisable to go over the metal with a metal cleaner and rust solvent which will remove rust that has started to form, even though it cannot be seen. This is especially important on metal which has stood over night, or for a day or two, after being sanded but not yet primed. If any soldering has been done on the job the soldering acids should be neutralized, as otherwise the finish is quite liable to blister or peel. This can be done by washing with a mixture of equal parts of aqua ammonia, alcohol and water.

After the metal is prepared, several coats of primer-surfacer will be sprayed over the area to be refinished. As the primer-surfacer will not do all the required filling with one application, one or two additional coats will be needed (allowing 15 to 30 minutes between coats to permit them to dry thoroughly). Two or three thin coats are far better than one thick coat. Where imperfections or scratches are unusually deep, the use of lacquer glazing putty will save time in getting a smooth surface.

Where there is an area of bare metal surrounded by old paint it is necessary to find out whether the old paint has good adhesion. This can be easily checked by sanding through the finish and feather-edging a small spot. If the thin edge does not break or crumble and the edge can be sanded thin enough to feel perfectly smooth, it may be assumed that the old paint will stick tightly enough to paint over it safely.

The next step is to remove thoroughly any grease or old wax on the surface.

There may also be traces of silicones used in some auto polishes; which must be removed as far as possible. Do not use gasoline, which is a poor wax solvent and will not remove deeply imbedded wax or silicones. Before the job is sanded it should be cleaned with a good wax and grease remover; and after sanding, it should be given a final cleanup with the same material. Unless the cleaning liquid used is recommended for removing silicones, it is well to use a silicone remover also—though paint additives are now available which will generally avoid finish "fish-eyes" due to silicones.

It is best not to use shop towels or wiping rags furnished by a laundry service, as these often are oily or have chemical residues. The wax and grease remover should be applied to small areas of the work, and wiped up with a clean cloth while the surface is still wet. When no more scum comes off on the rags, it is safe to assume that all of the old wax or grease has been removed.

TEST THE OLD FINISH

Unless it is already known whether the finish is lacquer or enamel, a test should be made. Old lacquer coats can be dissolved by rubbing a small area with a finger wetted with a good grade of lacquer thinner. If the old finish is not dissolved, and so does not come off on the finger, it can be assumed that the finish is enamel. If the old finish is lacquer, however, precautions must be taken to prevent absorption by the old lacquer of the solvent in the newly applied lacquer; which would cause swelling of the old coat. Swelling usually occurs where sanding has been done, and unless the newly applied solvents are prevented from reaching the old lacquer, it is impossible to prevent the sand scratches from showing.

Sealers for this purpose are available, which have good adhesion to old finishes and will prevent penetration of the solvents used in the finishing coats. If primer-surfacer is required for filling any rough or low spots, it should be applied before the sealer is used.

Modern primer-surfacer materials carry a high proportion of solids, and when sprayed on a surface will build up the film thickness quite rapidly. The primer-

Fig. 2. Hand sanding with wet-or-dry abrasive paper of the proper grade will prepare the surface of the primer-surfacer or surfacer so that after proper drying, it can be brought to a scratch free surface that will take the finishing lacquer or enamel coats without showing scratches.

surfacer has the adhesion of a primer with the filling ability of a surfacer. Its function is to place sufficient material on the surface so that after drying and shrinking the surplus material may be sanded off to the level of the low spots. Where synthetic enamel is used, it is still advisable to use a lacquer base primer-surfacer. It is important that the painter understand the true function of the primer and handle the material in strict accordance with the maker's recommendations.

Regardless of whether synthetic enamel or lacquer is used as a finishing coat, the paint will not materially smooth a rough original surface. To get a smooth job demands starting with a smooth surface; so a primer is

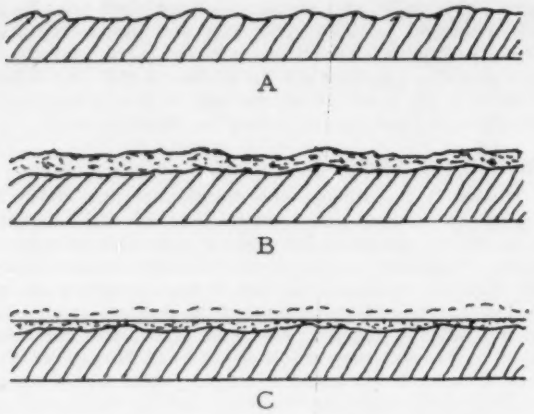


Fig. 3. At A is shown an enlarged cross section of bare metal with its comparatively rough surface; at B, the same metal coated with primer-surfacer. Notice that the surface of the undercoat follows substantially the contour of the metal surface. Sanding off of the high spots (as shown at C) produces a flat, smooth surface. If the primer surfacer is not fully dry when sanded, shrinking over the deeper depressions will produce uneven surface marks and will show file or grinding marks.

used to get good adhesion, and a surfacer or putty to fill up the rough spots. The primer-surfacer referred to previously may be used to perform the functions of both primer and surfacer. When the surface is built up it is sanded until all of the high spots are brought down to the level of the low spots. If some of the metal shows through before the level is brought down to that of the low spots, more primer or primer-surfacer is sprayed on, followed by further sanding until the surface is smooth.

Glazing putty is used for filling particularly rough surfaces that cannot be filled satisfactorily by the primer-surfacer. Glazing putty is similar to a surfacer, except that it is much higher in solids content and therefore has better filling ability. Spot putty or hard putty is the same as glazing putty, except that it contains an even higher proportion of solids, so that it is better for filling rough spots, scratches or holes. Where these depressions exceed 1/16" it is better practice to level them off with solder before using the putty. Lacquer putty should be applied over the primer coat. Synthetic putties, where used, may be applied directly to the bare metal.

WHY SCRATCHES SHOW

When applying primer-surfacer, two or three medium-wet coats should be put down. Thin dry coats of primer surfacer are liable to have poor adhesion; so always spray wet coats. This material may be sanded in 15 or 20 minutes; but for the best results it is better to wait an hour or longer, depending on the thickness of the coat and the temperature. This will help to eliminate file or

Fig. 4. At A is shown an exaggerated section of metal with sand scratches with primer-surfacer applied. Shrinkage being more over the deep fills, will show through when the material dries, revealing scratches. At B is shown the result of sanding level before the material is dried. Shrinkage will leave furrows over the scratches in the metal. At C we see the result of applying lacquer on the surface shown at B. Swelling of the primer-surfacer will bring it back to level at the time of sanding. At D is shown the result of drying of the solvent from both the lacquer and the primer-surfacer. The scratches will show more prominently than they did over the surfacer alone. This emphasizes the importance of allowing ample time for the solvents to evaporate, which will avoid the effects of shrinkage when sanding is done too soon.

grinding marks. If the primer-surfacer or surfacer is sanded before all the thinner has evaporated from the film over the file marks or scratches, the material in the scratches will continue to shrink and will show up in the final finishing coats. More care in the metal finishing and the use of finer grit sandpaper, also will help to eliminate the effect of scratches.

After the primer-surfacer has dried thoroughly, sanding is in order. Some painters use No. 220 or No. 240 grit sandpaper, but the use of such coarse grit will produce scratches hard to fill with the final finish coats. The only reason for using these coarse papers is to speed-up sanding; which is hardly necessary, because the present day surfacers sand easily. It is not necessary to use anything coarser than No. 320 to 360. To get an even smoother surface, use No. 400 for final sanding.

The importance of sanding down to fine grades of abrasive paper, and thus obtaining the smoothest possible surface, is obvious when you consider what happens after lacquer color is applied. Finish thinner penetrates the lacquer undercoat—producing swelling. The swelling will be greatest where the undercoat is heaviest, as in deep scratches. If the finish lacquer is sanded and polished before all the thinner has evaporated, the scratches will become visible as the remaining thinner evaporates and the coat shrinks further, with maximum shrinkage at the points of the deepest fill—in the scratches.

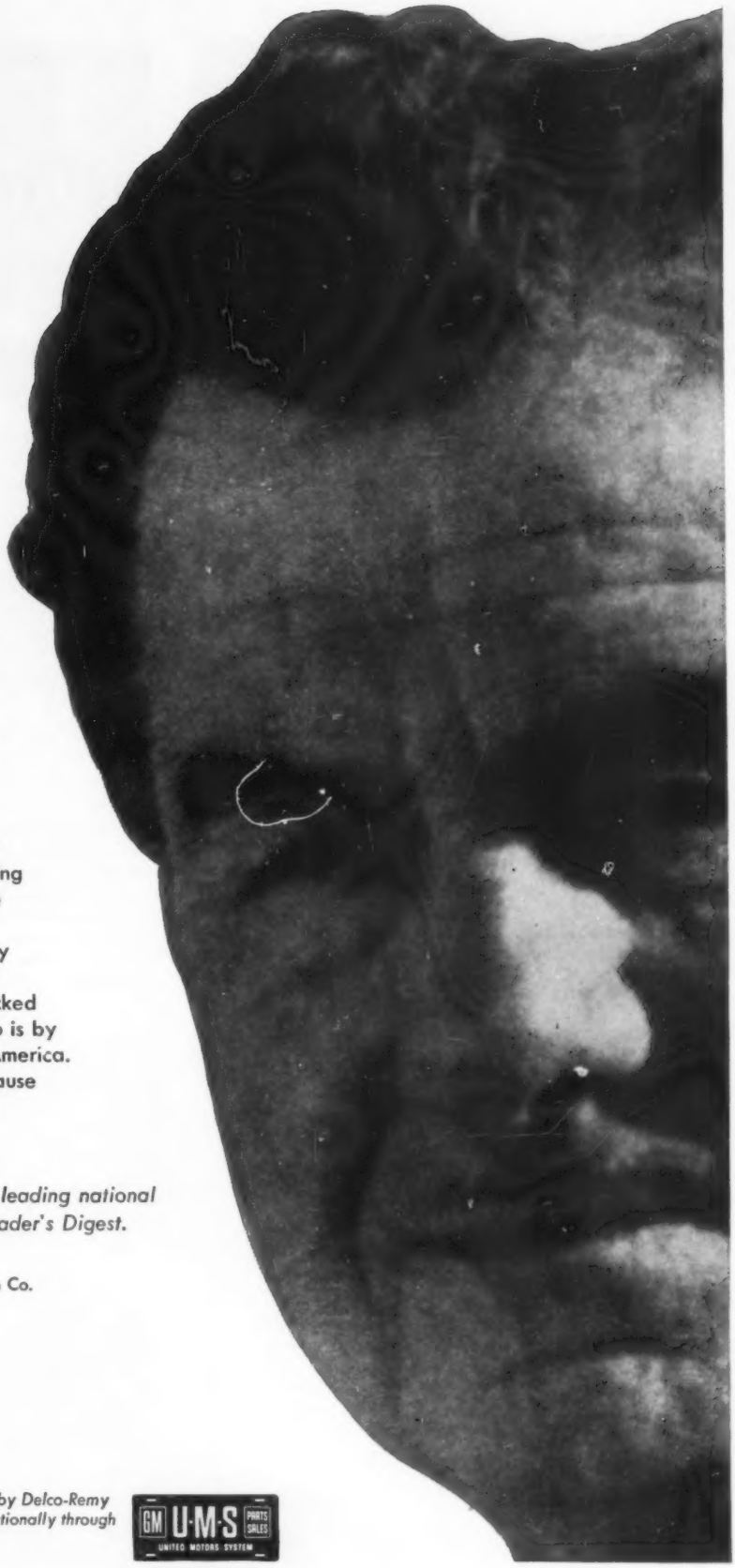
Accordingly, care must be taken to allow ample time for the lacquer finish to dry before it is sanded and polished.

When there is danger of sand scratch swelling, it is advisable to spray a light fog initial coat of the color. This light first coat will keep to a minimum the solvent content that first comes in contact with the feather-edged old finish.

Figures 3 and 4 illustrate the effect of swelling and shrinking on the finish surface. If the undercoat is not allowed to dry down completely before sanding and ap-

(*Continued on page 77*)

YOUR STAR SALESMAN



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The case for automotive craftsmanship

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By GUY F. WETZEL
Technical Editor

● TODAY'S MOTOR CAR is a precision-built, tight-tolerance, high-output machine that delivers tremendous power. It is a race horse alongside a dray horse in comparison to the automobile of just a few years ago.

This premium performance and the advanced design that makes it possible, impose greater responsibility—along with greater business opportunity—on the automotive service shop than is generally realized, or accepted.

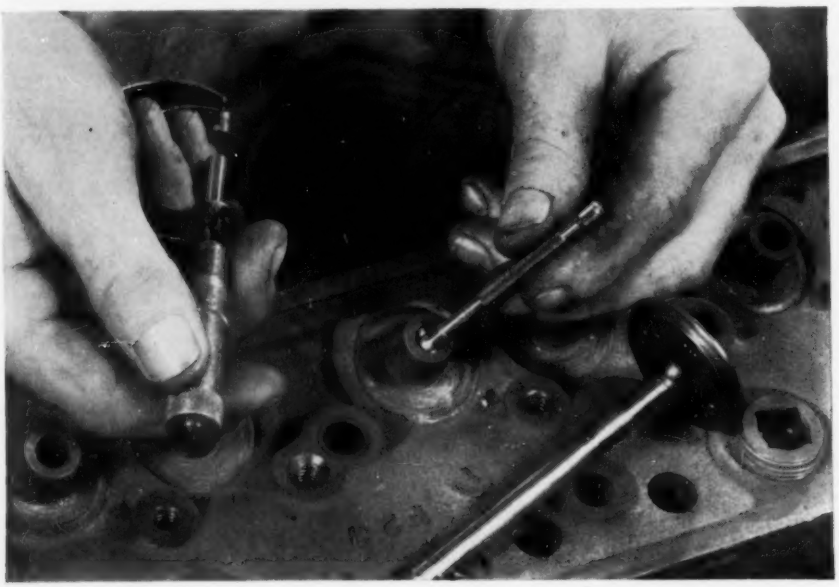
Just as the thoroughbred of the racetrack requires the most careful care to stay in top condition, the precision automobile of today needs skilled and conscientious servicing to perform at its best. Only top mechanical craftsmanship can keep the modern car delivering power, speed and convenience at its built-in, trouble-free best.

THE PREMIUM ON PRECISION

To appreciate fully the need for craftsmanship in modern service work, study the comparative figures in the accompanying table. Notice particularly, the increase ranging from 60 to more than 80 per cent in horsepower per cubic inch; the rise in compression ratios from an average of about 7.0:1 to one of approximately 10.0:1. All this has taken place over the 10-year period, 1949-59.

With this upsurge in power and compression have come greater demands on parts and assemblies. These, of course, are the inevitable result of higher temperatures, pressures, engine speeds, stresses and loads; more severe valve conditions, and longer and more frequent operation. In turn, the dramatic change in the work environment and rate have made it necessary that mechanical parts fit and function within a spec of a few thousandths of an inch; that they get more and better lubrication and cooling, and are repaired or replaced quickly when necessary.

Our modern car is a complex "community" of interrelated and inter-dependent parts, sub-assemblies, assemblies and systems. When any component works poorly because of wear, a defect or improper adjustment, the car as a whole "suffers." It runs below normal efficiency at



Accurate measurement of valve stem guide wear is made with a ball-type gauge (in guide hole) the width of which is transferred to a micrometer. Bell-mouthed guide wear precludes use of a plug gauge.

Checking the back-lash between the ring gear and pinion, and gear tooth rubbing pattern for showing the correct setting of these two important new parts. It's an indication that this precise job has been well done.

Craftsmanship implies care and accurate measurements as exemplified by this mechanic, who follows correct procedures. Here he is "miking" spacers for a rear axle job where clearances and fits must be right to a thousandth of an inch or less.

the best—and at the worst, may be well on the way to requiring extensive and costly repair or rebuilding.

In short, the modern car performs pretty much in proportion to the skill with which it's serviced. When the service work it gets is careless or inept, results can be tragic. For example, consider these rather common service operations—and the consequences of doing them poorly or improperly.

ENGINE CHANGES, 1949—1959

Make		Engine type	Compression ratio	Displ.	H.P.	Torque	H.P. per cubic inch
Car "A"	'49	6-OHV	6.6:1	216.5	90	174	.41
	'59	V8-OHV	9.5:1	348	250	356	.72
Car "B"	'49	V8-L	6.8:1	239	100	180	.41
	'59	V8-OHV	8.9:1	332	225	325	.68
Car "C"	'49	6-L	7.0:1	218	97	175	.45
	'59	V8-OHV	8.0:1	318	230	340	.72
Car "D"	'49	8-OHV	6.9:1	248	120	215	.48
	'59	V8-OHV	10.5:1	401	325	445	.81
Car "E"	'49	V8-OHV	7.5:1	331	160	312	.48
	'59	V8-OHV	10.5:1	390	325	430	.83
Car "F"	'49	6-L	7.0:1	230	103	190	.45
	'59	V8-OHV	10.1:1	361	295	390	.82

DISTRIBUTORS DEMAND KNOW-HOW

An automotive craftsman working on an ignition distributor, is alert for play in its shaft. He knows that loose bearings throw the distributor out of time. When the cam comes into contact with the rubbing block, the cam is pushed to one side; and the points are not opened at the normal speed. The result of the points opening too slowly is that the current arcs across the gap between them for a time.

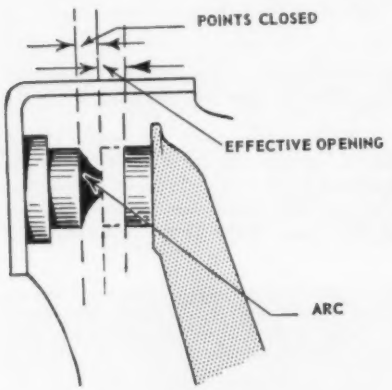
Not only will such arcing destroy the points themselves, the timing of the engine will be affected, since the spark at the plug cannot be created until the arcing ceases. If the arc follows the points until they are from .008″ to .010″ apart, the spark at the plug can be as much

Even relatively simple operations, as testing batteries, can be done with understanding and thoroughness. This young mechanic is on his way to become a craftsman—he does things the right way, for example, in using an open circuit voltage tester for trouble shooting.

Meticulous cleanliness in craftsmanship must be observed. A speck of foreign matter can mean a poor job, and no craftsman does poor work. Here, a clean rag is used to insure surfaces free from trouble-causing grit, dust or metal particles.

as 10 to 20 degrees late.

Naturally, the engine will be sluggish... the customer dissatisfied, with good reason. Further, there's more



Effective breaker point opening exists from end of spark drag-out to full open position.

trouble ahead for this driver. The condition within the distributor throws an overload on both coil and condenser, either of which may fail, sending the car back to the shop.

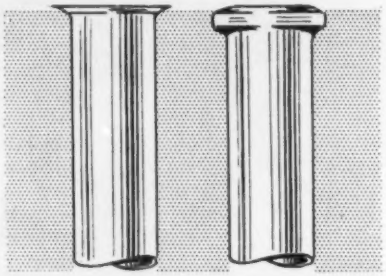
Without craftsmanship in the shop that does tune-up, basic faults like play in the ignition distributor shaft are overlooked. The owner who brought his car in to have it put in top operating condition, goes out to be disappointed in its performance. Worse than that, he'll soon need more service work, which wouldn't be necessary if the job had been done right in the first place.

"LITTLE THINGS" MEAN MUCH

When it's necessary to cut-off or flare a brake line, an automotive craftsman makes it a point to double-flare. He knows that a double-flared tube provides more strength and better seating. On the other hand, when single-flared, the tube is apt to crack, resulting in leakage of brake fluid—or worse!

Miking valve guide ID is another common, but important shop task in which craftsmanship shows up—and pays off. The truly skilled shop man uses a ball type gage, as shown in the cut, to measure the inside diameter of the guide; then gets an accurate reading by using a micrometer on the gage. Why? Because he realizes that valve guides wear bell-mouthed or oval; so that their inner diameter cannot be accurately determined with a plug gage.

To the car owner, the mechanic's understanding and care are important because of the key function the guides play in his engine. Their role in transferring some of the valve heat to the coolant is seriously impeded by the



The double flare (right) is used by the craftsman on a brake line. Single flare is apt to crack.

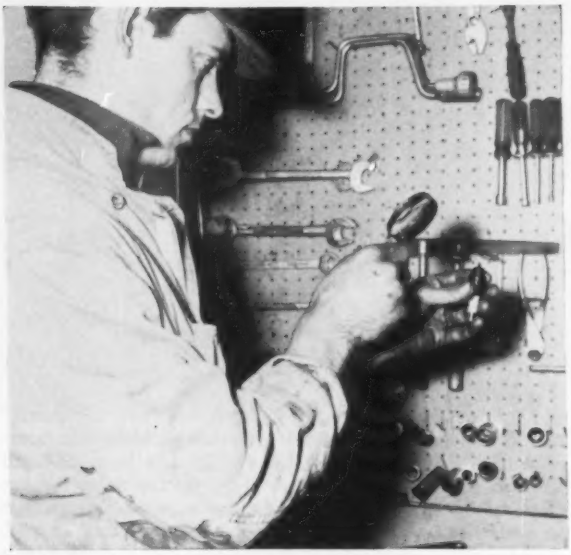
excessive clearance that results from bad wearing. If the condition isn't detected and corrected, there will be annoying chatter: far worse, the valves may be burned, requiring an expensive repair job. Again, the additional work would be unjustified; and would certainly have been avoided by the proper mechanical craftsmanship.

PROGRESS IS CONTINUOUS

Any modern model in the "low price three" is roomier, faster, more powerful and far better looking than the luxury models that were the "last word" in 1949. Cars of mid-50's vintage and later, ride with a quiet smoothness undreamed of 10 years before; handle with an ease that only a few could have foreseen.

Motorists appreciate and "buy" these highly engineered features. Unfortunately, though, too few car owners understand the modern automobile itself—and its service needs. As a result, drivers neglect their cars—fail to obtain the necessary work and services at the proper

Using the battery-starter tester or other instruments properly is one attribute of a craftsman. Here a capacity test shows, unfailingly, the condition of the battery.



Analysis and careful examination of spark plugs is part of good craftsmanship. It can easily make the difference between good and poor engine operation. Examining a plug with a magnifying glass tells more than can be seen with the naked eye.

time—and often abuse the vehicle unknowingly.

It's up to the service shop to undo the results; and if possible, to teach the car owners how to handle and care for the modern automobile to get and keep its built-in best performance. Only a mechanical craftsman is really "up to" the dual responsibility.

Designs, tools, shop equipment and car specifications are constantly changing as automotive engineers develop new and better parts and assemblies. The shop man who wants to keep pace with his trade must be a craftsman, first of all.

Gone are the days when engines could be tuned "by ear"; when bearings were scraped, and tolerances were loose enough that top quality work could be done with limited facilities and a few tools. To service the modern "race horse" engine successfully, requires that the shop man understand and observe its specifications. The same applies to the broad range of auxiliary equipment—power steering, power brakes, air conditioning, automatic seats and windows, etc.

Multiplying the various parts, assemblies and sub-assemblies by the makes and models in current use, gives an idea of the complexity of modern car servicing. All the necessary information is available in printed form. It must be studied, assimilated and used conscientiously, before automotive shop work can be properly performed.

The automotive service field has at least two powerful incentives to upgrade shop work quality to the maximum. In the first place, there's the best interest of the mechanic himself. He must become highly skilled—competent to meet any mechanical problems on any make of car—if he is to progress in his trade. That is his only route to success; and can only become a longer road with every day he delays equipping himself with the needed data and skills.

More importantly, in the second place, the shop itself faces exactly the same challenge. Progressive shop management is alert to the advantages of a "name" for quality in winning the battle for business. Shop owners realize that the customer—who after all, is still "king"—appreciates more fully than anyone else, the case of craftsmanship.

Resistance Type Spark Plug Cables Used on '59 Chryslers—Handle With Care

Chrysler and Imperial engines for 1959 use conventional spark plugs (without resistors) along with a resistance type spark plug cable to eliminate radio interference. For identification purposes, this new cable has "RADIO" printed on it.

By now most mechanics are familiar with this resistance core cable, and the advantages it offers over conventional cable; but certain precautions *must* be observed in handling to prevent damage to the graphite or composition type conducting core.

PULL STRAIGHT UP, AND EASY

The cable should be removed from the spark plug by grasping the cable cover and pulling *straight* off with a steady, even pull. Pulling sideways could jam the terminal on the spark plug and cause the cable to separate from the terminal. The cable terminal should not be crimped to the point that excessive force is required to remove it from the spark plug.

The cables should never be removed by giving them a quick jerk. Doing so can stretch the core and cause a high resistance or an open circuit. If a damaged core is suspected, a resistance test with an ohmmeter should be made. The resistance of the various plug cables will vary because of the different lengths.

Resistance specs, as given by Chrysler are: Spark Plug Cable No. 1—8300-16600 ohms; No. 2—5500-11000 ohms; No. 3—8100-16200 ohms; No. 4—6000-12000 ohms; No. 5—8800-17600 ohms; No. 6—6300-12600 ohms; No. 7—9400-18800 ohms; No. 8—7200-14400 ohms.

If any cable has appreciably more resistance than specified, check to be sure the terminals are in contact with the pin, and the pin is in full contact with the core. If the terminals and pins are properly installed and the cable resistance is still appreciably more than specified, the cable should be replaced with a new resistance type cable.

A new terminal should never be attached to the resistance core cable unless the wire pin is in place, otherwise, contact will not be maintained with the core. This will result in arcing and burning of the core which will cause engine malfunctioning and radio interference.

Needless to say, resistor type spark plugs should never be used with the new resistance type cable. The added resistance of the spark plugs may cause malfunctioning of the ignition system.

Watch Where You Place Spacers on Dodge Truck Engine Governors

Two spacers are used with the engine governor used on Dodge D & C T900 model trucks; one between the intake manifold and the governor body and one between the governor body and carburetor. Since the two spacers are of different thickness, the governor will not be operative if the two are interchanged—the carburetor throttle blades will interfere with the governor blade and force it open.

Properly installed, the thin (5/16") spacer goes between the intake manifold and governor. The thick (11/16") spacer is then installed between the governor and the carburetor.

Great progress has been made in tools and supplies to speed up the repairing of car bodies, but it still takes the "touch" and "know-how" of experienced mechanics to get the most satisfactory results, even on those ever increasing . . .

By ED PACKER
Member, S.A.E.

Minor body repair jobs

• "LITTLE" BODY JOBS have become big business. Wrigley did okeh with a stick of gum . . . millions can afford a stick of gum; but not so many go for a big box of candy. Today, literally millions of motorists are in the market for the removal of small dents, polishing out of scratches, alignment of hoods, servicing rusted-out parts.

Many motorists don't even realize that such service costs little, but does much to preserve the appearance and value of their cars.

Today's congestion, particularly in parking areas, is adding to the need for body repairs. Everyone has seen

Fig. 1. Using hydraulic pressure to bring fender back into alignment.

a parking attendant, often aided by a couple of pals, trying to move a car. They give the hood and fenders the old "heave ho." Sometimes the car doesn't move . . . but it's a safe bet that the hood and/or fenders do. It may be only a fraction of an inch. But from then on the owner may wonder what is chipping the paint from the rear edge of the front fenders or the front edge of the front doors. Or perhaps the hood is rubbing paint from the front of the cowl or from its own rear edge.

Point out the answers, and you have the job. Correction is relatively easy.

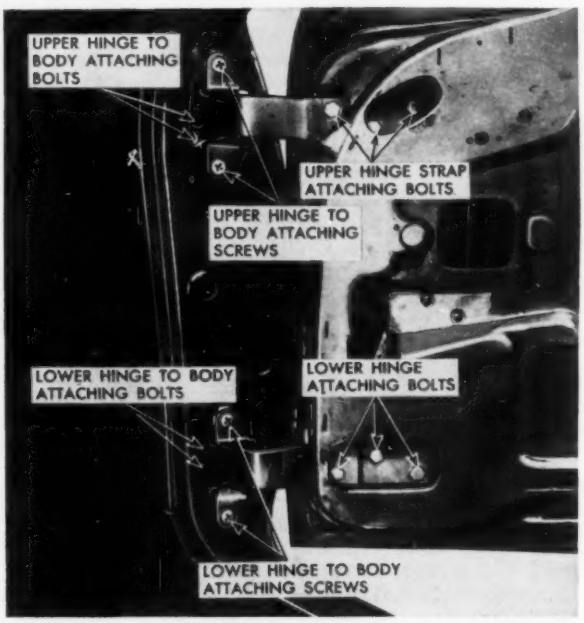
With the controlled pressure of such hydraulic equipment, as shown in Fig. 1, the fender assembly and all sheet metal attached to it can be moved forward where it belongs.

It is wise before applying the pressure, however, to loosen slightly the bolts that secure the fender to the body and its other mounting points. These are commonly spaced at about 8- to 10-inch intervals all along the inner edge of the fender. When the fender has been brought forward so that it is no longer stuck by the door, tighten these bolts. Get the door-to-fender clearance the same on both sides.

If fender movement fails to re-establish proper clearance at the front edge of the door, remember that the door itself may have shifted. Points for door adjustment are shown in Fig. 2. Obviously space makes it impossible to illustrate all constructions, but this Chevrolet photograph shows the many provisions for aligning a door in its opening.

Understandably, the trim panel must be removed. Then the attaching bolts or hinge screws should be loosened just enough to allow such shifting of the door relative to the body as is necessary to obtain alignment. Loosening the screws excessively makes the job suddenly worse as the door drops. Furthermore, excessive looseness means that the door will not stay put when opened for the tightening of bolts and screws. Some mechanics take a sharp scriber and mark around each hinge *before*

Fig. 2. Chevrolet door installation, showing location of hinge bolts and screws.


UPPER HINGE TO BODY ATTACHING BOLTS
UPPER HINGE STRAP ATTACHING BOLTS
UPPER HINGE TO BODY ATTACHING SCREWS
LOWER HINGE TO BODY ATTACHING BOLTS
LOWER HINGE ATTACHING BOLTS
LOWER HINGE TO BODY ATTACHING SCREWS

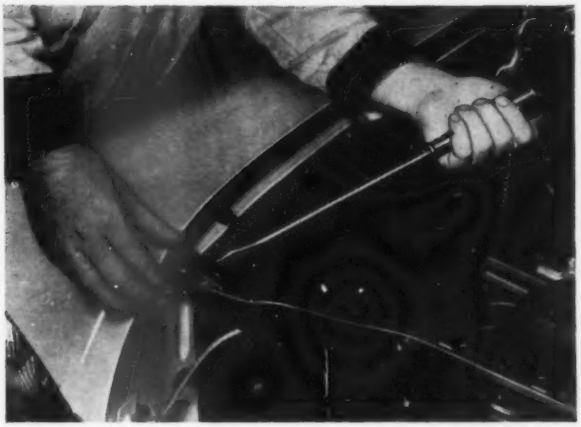


Fig. 3. Installing shim to give proper clearance when hood is lowered.

loosening. Then if things get out of control and the door drops accidentally, it's fairly easy to get it back to its original position and start over.

Gentleness and judgment are necessary when shifting a door. If a front door must be raised straight up, the upper *and* lower hinge bolts are loosened very slightly and the door is lifted with a well-padded jack, the pressure applied from beneath in line with the hinges.

If there is a wide gap toward the top of the door, the lower hinge bolts will be left tight, the top ones loosened, and force applied at the bottom rear edge of the door. If the door gap is wide along its front edge near the bottom, the upper hinge bolts will be left tight, the lower ones loosened, and you would more or less "chin yourself" on the rear of the door.

In the case of convertibles, the misalignment of the door—any door– may be due to improperly torqued body bolts, which throw the body out of line.

Hood alignment is handled by loosening slightly those hood hinge bolts that pass through oval or oversize holes in the hinge assembly. Loosen these bolts just enough so that the hood can be shifted on the hinge. Then close the hood gently and note the width of the crack along the left and right edges. It may also be necessary to loosen the bolts that hold the hood latch. Then the latch will be able to line up. Shake and pull the hood into alignment, open it gently, and tighten the bolts.

Sometimes it will be found that the space between the fenders is not sufficient to allow the hood to come down without striking and chipping paint. So when the hood is shifted at the hinges to clear the cowl along the rear edge, and to parallel the fenders, it may still be necessary to shim a fender out as illustrated in Fig. 3. To do this, loosen the fender bolts near the place where the "U" shaped rubber shim is to be added. Then snug the bolts up again after the shim is in position.

Sometimes the job works out the other way—the fenders are too far apart. In a case of that kind, remove a shim. On some cars, there are small rubber bumpers (like the one just above the screwdriver blade in Fig. 3) against which the hood rests when closed. Other cars have little adjustable bumpers that can be screwed up or down, so that the upper surface of the hood lies in the same plane as the adjoining fender.

These minor adjustments are easy to make, and many owners are only too anxious to have them made.

We wouldn't put the skilled body man in the same class with a car washer or polisher. But experience in-

Fig. 4. Power polishing body to restore like-new luster.

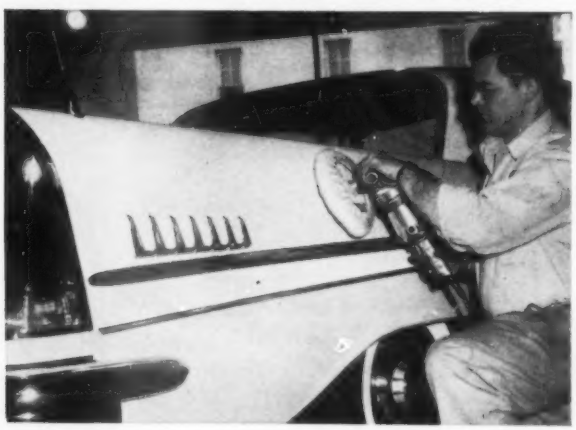


Fig. 5. A typical "parking lot dent."

dicates that on occasion the skillful use of rubber compound is needed to restore the finish "like new."

It is not unusual to see a motorist at the super market steady a box of groceries on the right rear fender while juggling his car keys. We all know too, what a girl's long finger nails can do to the paint in the vicinity of a door handle. Little children innocently amusing themselves by sitting on a gravel pile and playfully throwing the gravel at passing cars, also creates quite a demand for the man who can rub out the scratches. Then the new car luster can be built up by power waxing and polishing (Fig. 4).

With increased congestion in parking lots and on the highways, there is increasing demand for the removal of small dents. Not that we don't still have the *big* dents, those are here in abundance. But the frequency with which some motorists fairly "feel" their way out of a parking spot by bumping another car is developing a big volume in small jobs (Fig. 5). Such dents often appear on fenders, doors, or in the trunk lid. If you can get behind these dents readily, then it makes sense to bump the spots until they are flush with the surrounding surfaces. Still, a dinging job requires not only access to the back of the panel, but cleaning away undercoating and the sand and gravel that usually is imbedded in it.

Consequently dents of the kind seen in Fig. 5 are frequently handled by sanding down to the bright metal, and filling with body metal or one of the plastic repair

(Continued on page 36)

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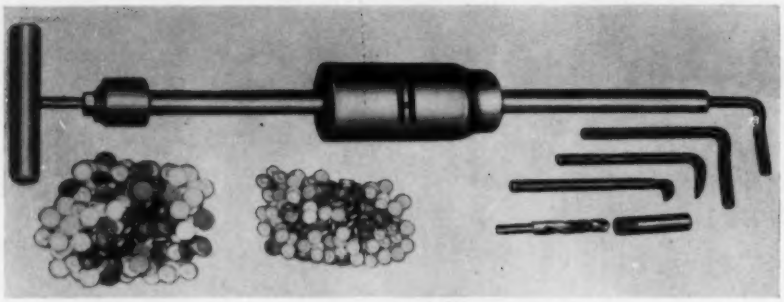


Fig. 6. Slide hammer type tool (H) and accessories for straightening sheet metal entirely from the outside.

Fig. 7. Hole is drilled in dented metal, with stop gauge on drill, as first step in straightening operation.

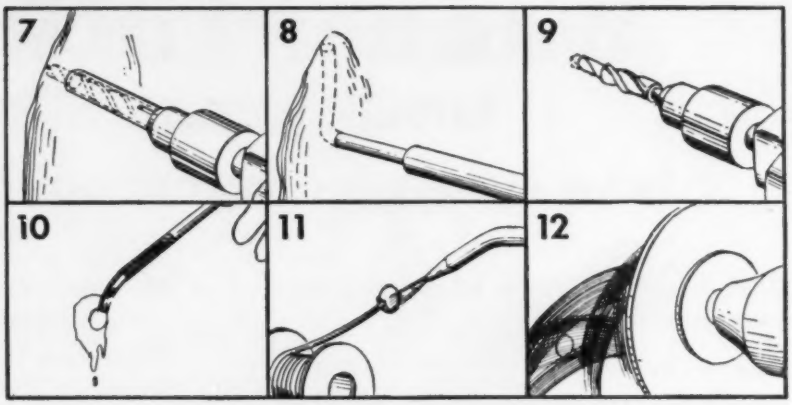
Fig. 8. L-shaped end of tool H (Fig. 6) inserted through hole to pull dent back level with surrounding metal.

Fig. 9. Hole is then enlarged to receive sheet metal plug.

Fig. 10. Hole and plug are fluxed for soldering.

Fig. 11. Soldering sheet metal plug into hole.

Fig. 12. Grinding plug and surrounding surface smooth.



materials specially created for this work.

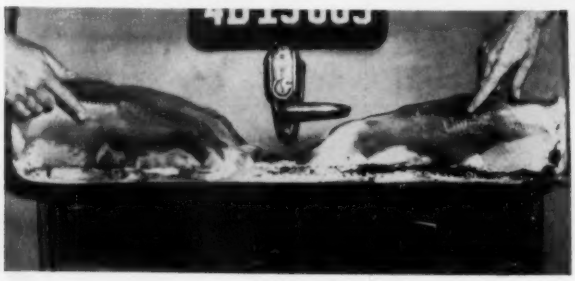
An effective type of body tool on the market operates by employing a hook-type impact or slide hammer ("H," Fig. 6). The specialized drill in Fig. 6 is used to make a hole in the dent (Fig. 7) so that the L-shaped end of the slide hammer can get in behind the dent, as in Fig. 8, and bring the damaged surface out flush with the surrounding metal. Then the stop gauge on the drill is removed, and the hole is enlarged to receive a finishing plug (see Fig. 9). A quantity of these are shown at the lower left of Fig. 6.

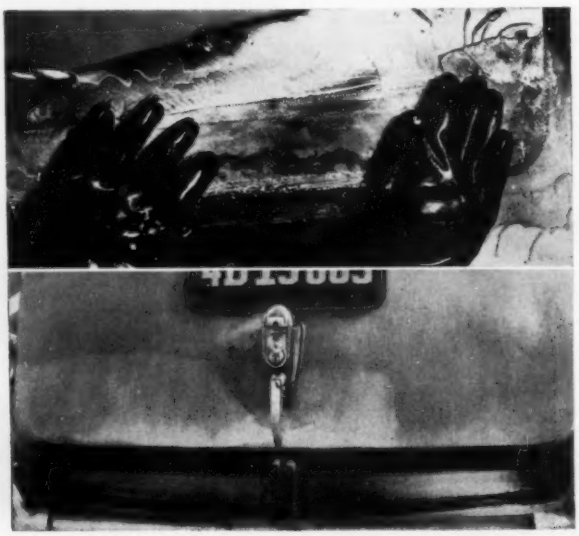
With the edge of the hole properly fluxed (Fig. 10) the plug is soldered into position, using a torch, as in Fig. 11, though a soldering iron may be used. Then the entire metal area is finished off by filing or sanding (Fig. 12).

Rust is a real problem in body service, but with the recent perfection of metal-bonding plastic repair kits, many shop operators report savings up to two-thirds in manpower and money when compared to the conventional body repairs with soldering and welding.

One example of where this type of repair saved the shop operator time and the car owner money, is shown in Fig. 13, where the entire bottom edge of a rear deck lid was attacked by "cancer." After the damaged area was thoroughly sanded and cleaned down to bright metal, Fiberglas patches, thoroughly impregnated with a resin-hardened mixture, were applied to the damaged area (Fig. 14) and left to harden or cure. When the patch had cured to the extent that it could not be gouged anywhere with a fingernail, it was then sanded to proper contour with a disc sander (working from the center of the patch outward), primed and painted to give the like-new appearance seen in Fig. 15.

Fig. 13. (below) Instead of replacing this rusted out rear deck lid, the body man thoroughly sanded and cleaned it down to bright metal, after which Fiberglas patches soaked in epoxy resin were applied, as shown in Fig. 14 (top right). The job was left to harden under a heat lamp, after which the patch was sanded, primed and painted to give a like-new appearance, as seen in Fig. 15 (bottom right).





Instrument corner

Conducted by The Instrument Man in the interests of simpler, faster, more satisfactory—and more profitable—service operations.

Rough Idle Trouble

● AS THE INSTRUMENT MAN was making out his report on the day's activities the telephone rang with a loud jangle. He picked up the receiver and listened as the voice at the other end said, "Jim, can you stop in tomorrow morning? We've got a couple of 1958 Mercurys in the shop with rough idle trouble that the boys don't seem to be able to smooth out; there's also a hesitation on gradual acceleration. Both cars have less than a thousand miles on them, and the customers are complaining." So Jim promised to drop in to see if he could be of help.

The next morning he stopped in at the dealer's shop, which had most of the testing equipment commonly used. They told the Instrument Man that they had completed the usual recommended modifications, but the rough idle persisted and apparently could not be tuned out.

Jim brought in the oscilloscope he carried with him in his station wagon and the first thing he did was to connect it up and make a quick check of the ignition system. The trace on the 'scope screen showed uneven firing lines, with four high lines and four low ones, indicating trouble on one cylinder bank. The spark line also showed some "hashing," indicating uneven carburetion. The carburetor hold-down bolts were tightened to eliminate possible trouble at this point. Then gasoline was squirted around the intake manifold from an oil can.

This gasoline was drawn into the intake manifold in sufficient volume to kill the engine on slow idle, indicating that the trouble was due to manifold leaks. To confirm this diagnosis, the combustion analyzer was hooked up. Running the engine showed definite leaning out of the air-fuel mixture, which at once became rich when gasoline was squirted around the manifold.

To make sure that the leaks were corrected, the manifold gaskets were removed, treated on both sides with gasket cement, and replaced. The manifold nuts were then tightened to the recommended torque.

The Instrument Man took this occasion to call the attention of the boys to the approved way to torque up such parts as manifolds or cylinder heads. That is, go over the nuts with the torque wrench, drawing them up to approximately one third of the recommended amount. Then go over them again, getting them to about two-thirds of the desired tightness, and finally the third time, tightening right up to the specified torque. He told the boys who had been working on the job, "You may be thinking to yourselves that this is a lot of unnecessary monkey business, but it's the only safe way to be sure of getting a tight manifold; and if you don't do it right, you're quite likely to have to do the job all over again."

The same treatment was given to the other car. When they were "fired up" they both idled as smoothly as could be desired, showing that the correct treatment had been applied. On acceleration the stumble was gone and there was a smooth, steady flow of power.

One of the mechanics who had been working on the cars came up to the Instrument Man and said, "Boy, you were really lucky to find out what was causing that rough idle and stumble, so quick."

"I wasn't lucky at all," Jim said. "If I hadn't used the 'scope I would have found the trouble anyway, either directly or by elimination; only I found it *quicker* by using the 'scope. You boys could do the same thing if you would remember what I have been telling you since your boss first bought those testing instruments for you. Where there is trouble, *something* must be the cause of it. If the action of the engine does not indicate the particular system that is at fault, you will have to go through a sequence of tests, and by proving out one after the other, you will locate the trouble-making system. Then by making detailed tests you can pinpoint the trouble maker."

WHY INSTRUMENT CORNER?

Because we know the help he's given so many shops first-hand is just as valuable in the re-telling as it was in the happening, we've asked The Instrument Man to pass along some of his more interesting experiences. As an old-timer in automotive servicing who is distinguished by the fact that he's kept up-to-the-minute on developments in his field, The Instrument Man gets many calls for help from friends, acquaintances and even strangers, in shops large and small. He generally solves the cases, because of his understanding and appreciation of trouble-shooting instruments.

Roughness Traced to Valve

As the Instrument Man was making his rounds in his territory, he stopped in to see one of his customers to whom he had recently sold an automotive type oscilloscope. He was anxious to see how the instrument was being used and whether its potential value was being utilized in proportion to the time it had been available.

When he entered the shop the shop operator came up to him and said, "I'm sure glad that you talked me into buying that scope. I had a '54 Mercury just yesterday that came in with a rough idle and poor mileage complaint. We would have found the trouble without the scope, but as you suggested, I put the scope on it the first thing. It showed a low firing line and a long spark line on one cylinder, which I thought indicated low compression on that cylinder. Also, the first wave of the coil-condenser portion of the 'scope trace was almost as high as the firing line."

"Yes," Jim said, "that, along with the long spark line, indicated that only part of the energy in the high tension system was used up in this cylinder in making the spark because of the decreased resistance to the spark in the lower cylinder compres-

(Continued on page 60)

Servicing main bearings

Skilled service specialists have perfected the practices that make for customer and shop satisfaction in the work. Any competent, experienced mechanic can handle the job . . . if he follows the ground rules—be thorough, let the outside expert handle certain operations, above all, practice cleanliness.

By ED PACKER
Member, S.A.E.

● ONE ENGINE may go 10,000 miles on a set of main bearings—another, 100,000 miles or more. Why the difference?

As you put the finishing touches on a main bearing job (Fig. 1), you can be sure that it will perform well only when you have followed the time-proven practices that experienced service men have found necessary.

Cleanliness is the first essential. Whether the job is done on the bench or in the chassis, total cleanliness of the outside of the engine and especially of the inside is a must.

The sludge being scraped from the valve cover in Fig. 2 is a common sight. No mechanic would think of putting the valve cover back without scraping off the muck, grit, and carbon seen here. But he will do more—with suitable solvent and a brush.

But many of us have seen mechanics working on engine bearings merely clean *some* of the sludge from the valve chamber and other internal parts of the engine. Nothing can take the place of a circulating type engine cleaner that rinses out all sludge with its bearing-killing grit and dirt.

The cleaning operation must include all oil passages. The shaft about to be installed in new bearings, Fig. 3, had just been brought over from the cleaning tank where filtered solvent had been allowed to flow through the oil passages. More than that, the passages had been brushed with a brush similar to that used for cleaning a rifle barrel. The clean cloth demonstration in Fig. 3 is the mechanic's answer to the challenge as to how clean these passages were.

Careful inspection during disassembly is as vital to

Fig. 1. For maximum bearing life and overall engine efficiency, all bearing caps must be accurately torqued to the car manufacturer's specifications.

Fig. 2. Scraping sludge from a valve cover.

Fig. 3. Proving cleanliness of oil passages in crankshaft.

final success as is constant cleanliness. Experienced mechanics instinctively lay parts out in the order in which they are removed. They note during disassembly that the bearing caps are properly stamped or identified so that they will go back correctly when the engine is built up. They observe, too, the degree and location of major wear as the bearings are taken out. In this way they get a "tip off" as to whether or not the block is warped, the bearing bores in bad condition, or the shaft in need of regrinding.

But inspection goes further. It is hardly expected that an independent repair shop would have a precision arbor for checking alignment of the bearing bores. If main bearing wear seems to be greatest on one side of a front main and an opposite side of a rear main, a warped block is a probability.

CHECKING BEARING BORES

The suppliers and distributors of bearings have the facilities for checking and correcting such a condition. In any event the main bearing bores should be checked for roundness. No insert-type bearing can be any more accurate than the bore that supports it.

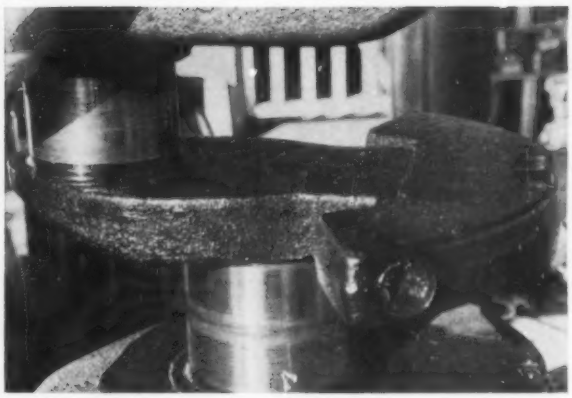


Fig. 4. Worn and scratched journal of crankshaft to be sent out for regrinding.

To check the main bearing bores, tighten the main bearing cap nuts alternately. As one mechanic said, "First gentle them down, then tighten them up."

Final tightening should be to the specified torque for the particular engine being worked on. This is commonly in the 65-85 foot pound range.

While an out-of-roundness gauge helps speed the job, a very good check can be made by using an inside mike in each bearing bore. If the bores are out of round more than .001 in., the condition should be corrected.

Federal-Mogul, for example, does this by removing about .010 to .020 in. of material from the parting face of all caps. Then the caps are bolted up in the usual manner and the assembly suitably bored. The point is that as little material as possible should be removed from the block, the remaining stock coming from the caps. Lack of precision in this area of the work can result in some very musical timing gears — chains not being quite so critical.

With the crankshaft washed clean (Fig. 4), stand it on end on the bench for convenience in measuring the main journals.

MEASURING MAIN JOURNALS

Check journals ¼ in. or more from each end—enough to be sure to clear the fillet radius. Take several readings around the journal and record each in order to see whether or not the journal is out of round. Then repeat this measuring at the other end of the journal, comparing the readings at the front and rear to check for taper.

If the journal surface is rough, as in Fig. 4, or shows out of round in excess of .001 in. or taper greater than .001 in., the shaft should be sent out for regrinding.

Shafts have been observed with smooth journal sur-

(Continued on following page)

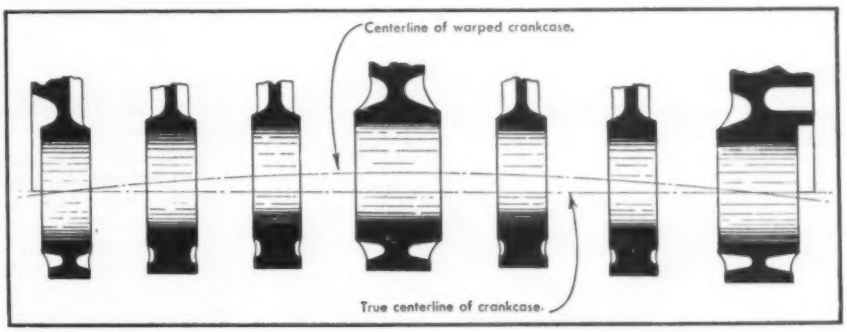


Fig. 5. Highly exaggerated view of what would happen to bearings installed in a warped crankcase.

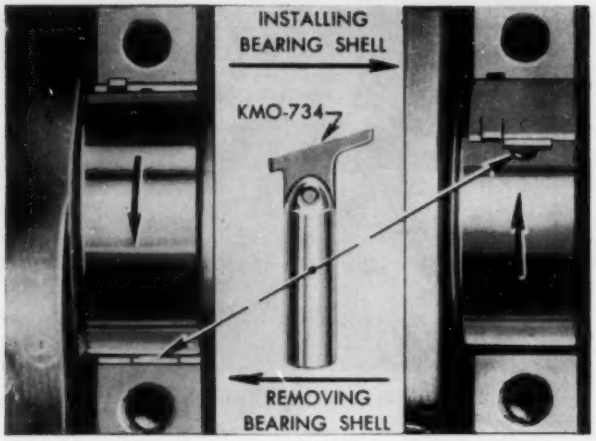


Fig. 6. How main bearing shells are renewed without pulling the crankshaft by using special tool.

Servicing Main Bearings . . . CONTINUED

faces which were out of round as much as .0015 in. When put into service without regrinding, the job seemed to be excellent. But it didn't take the engine long to become noisy, and then came the old argument between customer and the mechanic. The mechanic feeling quite sure that somehow the customer had "cheated" on oil quality or frequency of oil change. He could have been right. And the customer, feeling suspicious of the job, swore he'd never have an engine overhauled again. That's poor business all the way around. Doing an engine job really right is good business for all concerned.

If a shaft is sent out for regrinding, it will be checked for alignment also. Or this alignment check can be made before sending it out. All it takes is a pair of "V" blocks in which the end journals rest. Then with a dial indicator contacting the center journal, the shaft is rotated slowly. The reading should not exceed .003 in.

STRAIGHTENING SHAFTS AN "ART"

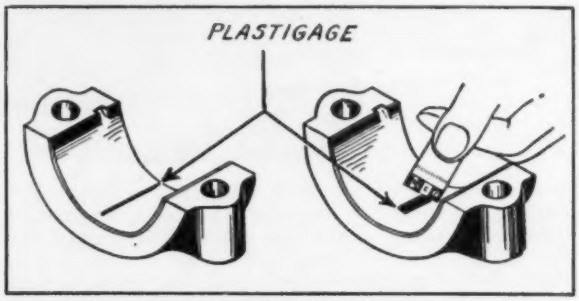
Straightening is accomplished in a powerful but accurately controlled press. To take out misalignment of .003 in. requires springing the shaft a "whisker" *more* than .003 in. the opposite way. Those who have performed this operation many times say that only "feel" for the job will bring accurate results.

In order to correct a sprung condition, it is necessary to pass what is known as the "elastic limit." But how much to pass it will depend upon the size and hardness of the shaft. Frequently, some mechanics have overdone the job, only to find that the shaft is sprung in the opposite direction. So unless you have precision equipment and are specializing in this kind of work, we'd say that it's better to let an expert straighten and grind the shaft.

STRAIGHT SHAFT DESERVES TRUE BEARINGS

The expert may also suggest that instead of doing any machining to straighten up the bearing bores in a warped crankcase (Fig. 5) that rough finished inserts be installed and the inserts be machined to bring the bearing surfaces in perfect alignment. This is also the best procedure in cases where the shaft has been reground and undersize bearings are required.

The main bearing service procedure under discussion has been based on an engine removed from the chassis. But a lot of main bearing service work is needed and done without removing the engine. In cases of this kind it is assumed that block and shaft alignment, as well as journal surface, are in passably good condition. Obviously if conspicuously bad conditions are observed when the bearing caps are dropped, then the major services under discussion will have to be performed.



Figs. 9 and 10. Left: Plastigage in place before bearing cap is torqued. Right: How Plastigage appears after bearing cap is removed.

Many bearings "pass out" at low mileage due to hard driving, low oil level, dirty oil, or to abuse resulting from detonation. Detonation may result from the car owner using low octane fuel, perhaps from cylinder deposits that have built up, or a spark that is too far advanced.

MAIN'S OUT—SHAFT IN

Where main bearings are to be replaced without removing the shaft from the block the upper bearing shell can generally be rolled out of the block and a new one rolled in by using the tool shown in Fig. 6.

It is still vitally important that every possible step for total cleanliness of the interior of the engine be taken. Realize too that especially on some of the older engines and currently on the Willys, this idea of rolling the bearing out is quite a trick. Unfortunately we don't have all the specifications, but do recall that the Hudson engine bearings were held in the block with a brass screw. As one mechanic put it, "These jobs were really screwed up."

Willys upper main bearings fit on a dowel pin in the block. When we talked this over with one mechanic, he insisted that the upper bearing *can* be slipped off of its dowel by letting the crankshaft drop a little more than 1/16 in.

Fig. 7. Correct way to reduce bearing spread to facilitate installation in block when shaft is not removed.

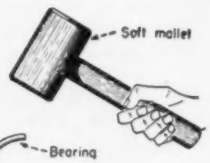
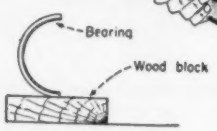
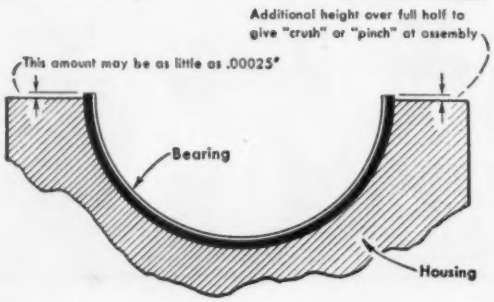


Fig. 8. (Below) Diagram explaining bearing crush needed to insure firm seating of the bearing in the housing.




Additional height over full half to give "crush" or "pinch" at assembly
This amount may be as little as .00025"
Bearing
Housing

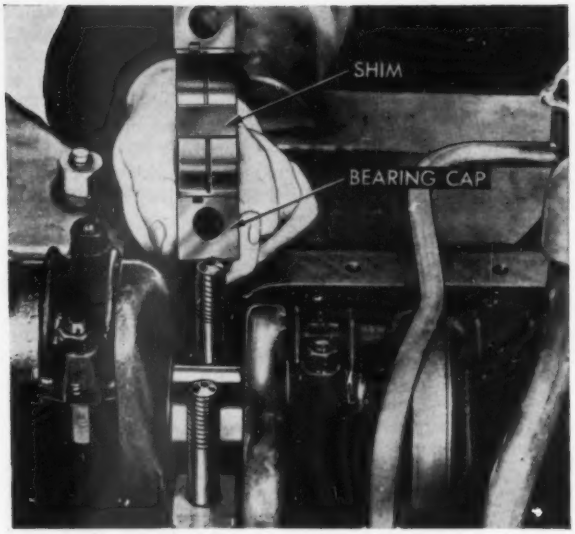


Fig. 11. How thin brass shim is installed in bearing cap to check clearance.

Most engines, however, are a little more "cooperative." Their bearings can be slid out and new ones installed as shown in Fig. 6.

"ROLL OUT THE BEARINGS"

Where it is decided to do an emergency operation and remove a bearing from the engine, remove the cap where the bearing is to be replaced. Back off the other caps so that the shaft is entirely free from the upper bearing. Get a roll-out pin of the proper size to fit in the crankshaft oil hole. Turn the shaft gently by hand until the projecting end of the tool is in contact with the bearing on the side *opposite* the bearing's locking lip. Continuing to turn the crankshaft very carefully in a direction toward the locking lip will slide the bearing from its position in the crankcase.

To install a new bearing, the crankshaft must be turned by hand in a direction opposite to that used when the old bearing was taken out.

Be especially careful to see that the crankshaft journal, crankcase bore, and the bearing back are clean. Flow a good "squirt" of oil up over the shaft and into the crankcase bearing bore, using a pump-type oil can.

Place the new bearing on the crankshaft journal with its smooth edge ready to enter the space between the shaft and the crankcase bore. Enter the bearing into the crankcase bore on the side that is milled to receive the bearing locking lip. Check the bearing alignment visually, and work it into place as far as possible with your fingers while watching the alignment of the locking lip with its slot. This is most important, for if the lip fails to enter its slot smoothly, the adjacent bearing surface may be badly damaged.

If this job is being done on a heavy wall bearing, the "spread" of the bearing across its open end may cause some difficulty. In a case of this kind, reduce the spread of the bearing very slightly by using a soft mallet and wood block, as in Fig. 7.

CRUSH AND CLEARANCE

When any bearing is in place it is vital to heat transfer and firmness of the bearing installation that the bearing's outside surface be in complete and positive contact with the housing bore. This is accomplished by engineering a very small amount of crush or pinch material into the meeting edges of the bearing shells, Fig. 8. Never file this off to make the bearing flush.

Specified oil clearance between the bearing and the crankshaft journal is a vital matter. Proper oil circulation around a bearing provides much more than mere lubrication. Proper oil flow also helps cool a bearing and keep it clean. The accumulation of "gook" that builds up in an oil filter didn't just grow in the filter. It is road dust that entered the engine, and carbon particles that built up in the engine. Most of this worked through the bearings and other parts until it was finally trapped in the filter. So if clearances are insufficient, the oil flow is reduced in a tight bearing. This means that dirt may be trapped within the bearing metal instead of washed away, temperatures may climb instead of being reduced, lubrication is interfered with and so the new tight bearing fails.

Minimum and maximum clearances for different kinds

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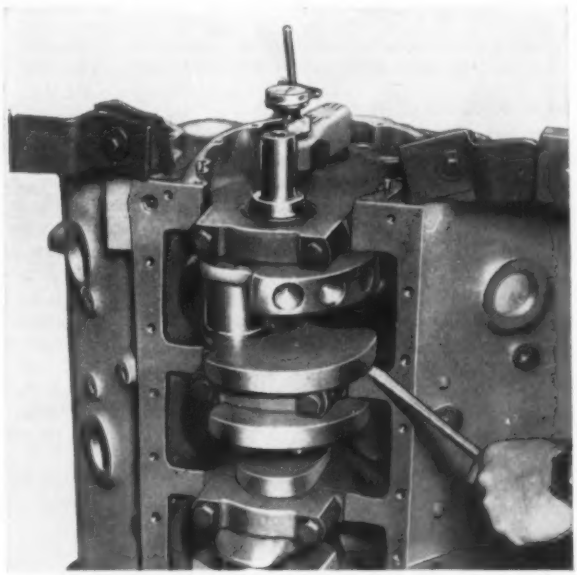

Fig. 14. Using a lever and dial gauge to measure crankshaft end play.

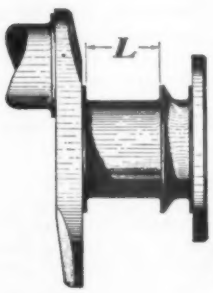

Fig. 12. Length "L" between thrust collars that controls shaft end play.

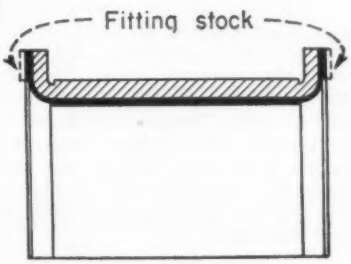

Fig. 13. Fitting stock on thrust bearing that can be scraped to adjust crankshaft end play.

Fig. 15. Using feeler gauge on center thrust bearing to measure end play.

Servicing Main Bearings . . . CONTINUED

of bearings based on shaft size and bearing material are as follows:

Shaft Size	Babbitt high lead or tin base	Copper Alloy	Three-Layer or overplated bearings	Aluminum Alloy (no overplate)
2-2¾	.0010-.0020	.0020-.0030	.0010-.0020	.0025-.0035
2 13/16-3½	.0015-.0025	.0025-.0035	.0015-.0025	.0030-.0040

MEASURING CLEARANCE

There are several ways to check bearing clearance. One is to use "mikes" and measure the difference between the inside bearing diameter and the journal diameter. A much quicker way is to use the Plastigage method, as in Figs. 9 and 10. Here a specially molded fine plastic wire about ⅛ in. shorter than the bearing is laid in the bearing, Fig. 9. Shaft and bearing must be free of oil. After tightening the bearing to specified torque, the cap and bearing are dropped. Then the width of the plastic wire that was squeezed out between the bearing and journal is measured. Since the wire was of a definite and controlled diameter, the amount that it is flattened in the bearing gives an accurate indication of how tight or loose the bearing is. A scale for measuring is printed on paper and furnished in quantity with the Plastigage.

If a bearing is tapered, the gauge will reveal this by the material being wider at one end of the plastic than at the other. If the bearing is out of round, different readings will be obtained if the test is repeated with the shaft turned 90° from its original position.

The use of brass shim stock, as shown in Fig. 11, is another popular way of checking bearing clearance. The thickness of the stock used should be the clearance desired. In using this brass shim method, be very careful to avoid marring the bearing surface. Actually the shim in Fig. 11 could be about ¼ inch shorter than the width of the bearing. It is also desirable that the edges of the shim be smoothed down on an oil stone, otherwise a sharp turned up corner might mar the soft bearing material.

Place clean SAE 30 engine oil on the shim stock to stick it securely to the bearing. Or perhaps better than pictured, curve the shim slightly and stick it to the journal with a drop of oil. Then assemble the bearing cap to the block. Using shim stock of the same thickness as the oil clearance desired, pulling up the cap should leave the shaft turnable with a fairly heavy drag (all other bearing caps are left loose during the test). Repeat the procedure with the crankshaft rotated approximately 90° or ¼ turn from the original test position. The next step is to remove the feeler, replace the cap, leaving nuts just finger tight, and then repeat the operation with the remaining bearings.

Using this method with shim stock the thickness of the desired oil clearance, failure to produce a heavy drag means excessive bearing clearance. If excessive drag results, there is insufficient clearance. Correct faulty clearance by trying different inserts—or, if tight, recheck for *dirt on the bearing!*

Sometimes the test just described is made with thin hard paper of known thickness.

Fig. 16. Installing a new timing case cover gasket.

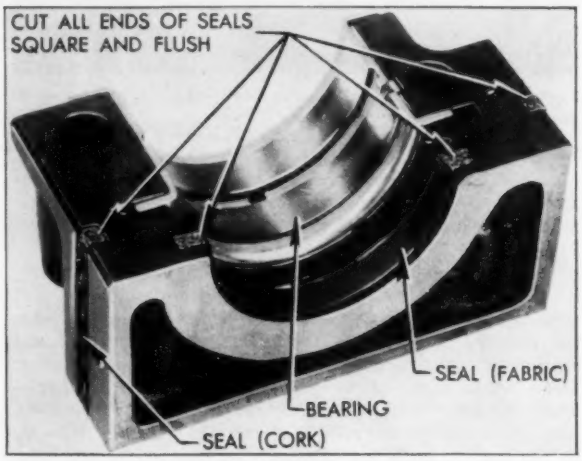

Fig. 17. Details of rear main bearing oil seals.

CONTROLLING END PLAY

End clearance of crankshaft must also be checked. One main bearing always has the job of controlling the end play of a crankshaft. If the play is controlled at the rear main bearing, as in Fig. 12, the length L minus the overall length of the thrust bearing will determine the end clearance or end play of the crankshaft.

Usually your jobber can furnish bearings with a length that gives correct end clearance. Where this is impossible, bearings can be had with fitting stock (Fig. 13) that can be scraped or machined to give the desired end clearance.

Normally this end clearance is as follows:

Journal Diameter (Inches)	Recommended End Clearance (Inches)
2-2¾	.004-.006
2 13/16-3½	.006-.008

Where a dial indicator is available, it can be set up to rest anywhere on the crankshaft and the shaft pried alternately fore and aft with a large screwdriver or small pinch bar (Fig. 14) to show end clearance directly.

Fig. 15 shows a Chevrolet V-8 block employing a centrally located thrust bearing. Here by forcing the shaft fore or aft the end clearance can be measured with a feeler gauge. While the illustration is made on a block mounted on an engine stand, this check of end play can be made quickly and easily while working under the car.

PREVENTING OIL LEAKS

With clearances correct and bolts torqued to specifications, the final step is to seal the engine against oil leaks.

Fig. 18. Driving oil seal into groove in block before cutting off surplus (shown by arrow).

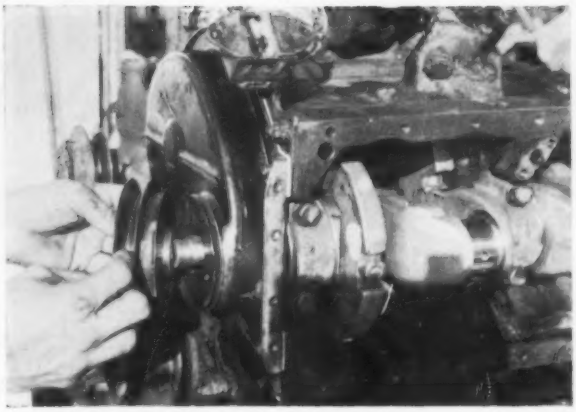

Fig. 19. Installing crankshaft pulley against new oil seal in timing cover.

Little need be said about the importance of installing new gaskets on smooth, clean surfaces at the oil pan and timing gear cover (Fig. 16).

A costly comeback may result if the wood or cork seals at the edge of the rear main bearing cap and the fabric or composition seal in the cap are not properly installed (Fig. 17). If there is too much seal sticking out of the cap, it must be cut off. But before cutting off the seal (see arrow in Fig. 18), the seal must be driven down fully into its groove. If the seal is up ever so little and the surplus seal is cut off, then when the shaft is in place the seal will be short and there will be a rear main bearing oil leak.

By the time main bearings need replacing, the timing cover oil seal will also need renewing, as illustrated in Fig. 19. Had a deep groove been worn in the hub of the pulley being installed, the hub or entire pulley would have been renewed on this bearing job. As it happened, the hub showed very slight wear, and the surface bearing against the seal was perfectly smooth, so the old pulley was installed on a new seal and the job proved to be oil tight.

Appreciation is extended to the following for use of illustrations. Figs. 6, 14, 15, 18—Chevrolet Div., General Motors Corp. Fig. 11—Chrysler Corp. Figs. 5, 7, 8, 12, 13—Federal-Mogul Service. Figs. 9, 10—American Motors. Fig. 17—Ford Motor Co.

Clutch Shaft Roller Bearing Failure Traced to Overgreasing During Overhaul

When overhauling a standard or overdrive transmission, care must be exercised when installing the roller bearings in the clutch shaft, according to a recent service bulletin from American Motors.

It has been experienced that failures occur at low mileage when using an excessive amount of grease to retain the roller bearings in the clutch shaft at time of assembly. The grease will plug the three oil holes, causing improper lubrication of the bearings.

A very light coating of petroleum jelly or oil on each roller is sufficient to hold the rollers until the last roller is installed, at which time the keystone effect will retain them in position.

The company also stresses the fact that the hole in the clutch shaft should not be filled with any type of grease or other heavy lubricant.

To make your shop more profitable . . . your time more valuable . . . be sure to read this month's "These Are New" section

Servicing the Triumph TR3

General knowledge of the design, observance of necessary clearances, tolerances and torquing specifications opens the door for custom or general maintenance applicable to this small import motor car.

• SHOPMEN WHO HAVE worked on the Triumph TR3, like it. This is due in part to the clean design that makes most of its units highly accessible. But the big factor that makes the Triumph TR3 a favorite in the shop is that the regular wrenches that would service an American car will take care of most of the jobs on the Triumph TR3.

Under the hood—"bonnet" to you—is a 4 cylinder engine with a bore of 3.268 in. and a stroke of 3.622 in., which with its 8.5:1 compression ratio delivers 100 brake horsepower @ 5,000 r.p.m.

The TR2 engine produced through 1956, was substantially identical, at least from the service standpoint, to the TR3 and delivered 90 brake horsepower @ 4,800 r.p.m.

Incidentally that "bonnet" which houses all these horses extends out to the center of the front fenders, and is opened with a key, like a lathe chuck key, as shown in Fig. 1.

LITTLE CHANGE

Except for upping the horses and installing a racing-type disc brake on the front wheels, the TR series cars have seen little change over a period of many years.

High points of this car's performance—performance which your service will do much to maintain—are as follows: an indicated 100 m.p.h. @ 3,600 r.p.m. in overdrive top; maximum r.p.m.'s of 5,000; 0-50 m.p.h. in 8 seconds; 25-30 miles per gallon, varying with the amount of lead the driver has in his foot.

Such performance requires a well-tuned engine. And any tune-up job should include a check of valve-rocker clearance. The removal of two nuts on the top of the rocker box or valve cover (Fig. 2) gives quick and easy access to these parts.

VALVE ADJUSTMENT

Valve adjustment should be made with the engine cold. On earlier models the setting called for was .010 in. for the intake and .012 in. for the exhaust. All of the TR3 car engine valves are set at .010 in. for both intake and exhaust. Both checking and adjusting these overhead valves

Fig. 1. Using key to open hood of the Triumph TR3 model.

Part V of a feature series

By ED PACKER
Member S.A.E.

Fig. 2. Rocker box cover is held in place by two nuts.

is done in the conventional manner (Fig. 3).

To be sure that the tappet is on the low part of the cam, the engine should be hand cranked—all spark plugs out—until the valve to be checked or adjusted has closed, *then give the crank exactly ½ turn more.* Having the plugs out makes the engine easy to crank, and what is more important, it stays put. You're going to have the plugs out for cleaning, gapping, or replacing anyhow.

Fig. 3. Valve adjustment is handled in conventional manner.

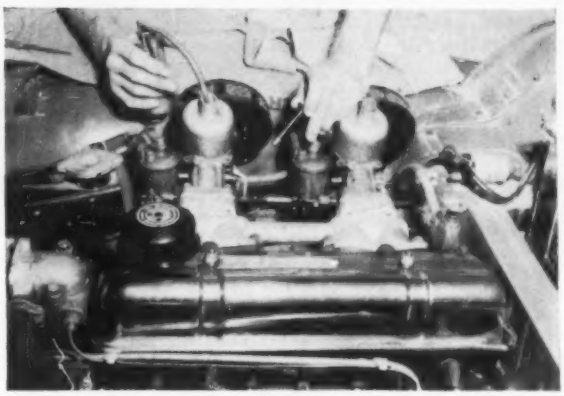

Fig. 4. Lubricating carburetor damper piston with engine oil.

SPARK PLUGS CRITICAL

Incidentally, spark plugs are critical in this power plant. The original equipment plug, and the plug recommended for replacement by the car maker is the Champion #L10S with ½ inch reach. For high-speed road work, the Champion #L11S is said to give better performance. Gaps should be clean and square, and spaced at .025 in. Regapping should be done at least every 6,000 miles, and plugs should be replaced at 12,000 miles.

The fuel system incorporates a conventional mechanical pump, which is mounted on the left side of the crankcase, and is driven in the usual manner by an eccentric on the camshaft.

The carburetor design deserves close study by shopmen servicing the Triumph. Two carburetors, shown in Fig. 4, are used. These carburetors, known as the SU, have several rather vital service needs.

OILING THE CARBURETOR?

It usually comes as quite a shock to the experienced American car mechanic to see someone oiling the inside of each carburetor, as is being done in Fig. 4. Use engine oil, the amount and frequency being such that the damper piston is *kept well oiled.* So let's take time out to get the high points of what goes on.

Figure 5 is a sectional view of the SU carburetor. To clarify the illustration, the jet lever (23) has been turned 90°. The float chamber is shown separately, and actually it can be removed by turning the float chamber attachment bolt (12) a few revolutions to the left.

The carburetor is of the automatically expanding venturi type. In this design, the cross sectional area of the main air passage next to the fuel jet, and the effective orifice of the jet, is variable. By studying Fig. 5 it can be seen that this is achieved by the rise and fall of the piston (3). The variation takes place in accordance of the demand of the engine as determined by the degree of throttle opening, engine speed and the load.

The distinguishing feature of this carburetor is that an approximately constant air velocity, and hence an approximately constant degree of vacuum, is at all times maintained in the region of the fuel jet. This velocity is such that the air flow demanded by the engine, in order to develop its maximum power, is not seriously interfered with, and good atomization of the fuel results under all operating conditions.

Maintaining a constant high air velocity across the jet, even under idling conditions, makes it unnecessary to have a separate idling jet. There is but one jet in each carburetor.

The flow of fuel from the jet is controlled by a tapered needle. Two kinds are shown in Fig. 7. The needles can be changed for specific purposes. The needle locking screw (7) in Fig. 5 holds the needle in position. Fig. 7 also shows the distance that the needle should project, when installed.

BASIC ADJUSTMENT

As with any carburetor, the basic adjustment for good performance is the float level. Figure 8 shows the hinged lever, and in fact, the entire top of the float chamber inverted. Gravity is holding the float needle on its seat. In this position the float level will be correct if a test bar 7/16 in. in diameter (a 7/16 in. twist drill is ideal) can just be passed between the inside radius of the lever and the flange of the cover, as shown.

To adjust the carburetors, have the engine up to normal operating temperature. Remove the two air cleaners. Loosen one of the two bolts used to clamp the throttle shafts together (Fig. 9). Remove the rod that connects between the two jet levers (23) of the two carburetors. Adjust the idling speed to approximately 500 r.p.m. by turning the throttle adjusting screw of each carburetor (2 in Fig. 5) the same amount.

Now listen to the hiss in each carburetor intake. Adjust the throttle adjusting screw until the intensity of the hiss is similar in both intakes. This will synchronize the throttles. When this is satisfactory, the mixture should be adjusted by screwing both the jet adjusting nuts (18 in Fig. 5) exactly the same amount without letting the jet lever (23) move. Prevent movement of these levers, by pressing on them, to be sure that the jets are firmly against the adjusting nuts.

As this adjustment is made the engine will probably run faster. So readjust the throttle stop screws to bring the engine back to 500 r.p.m.

To check the mixture adjustment, reach in through the carburetor air

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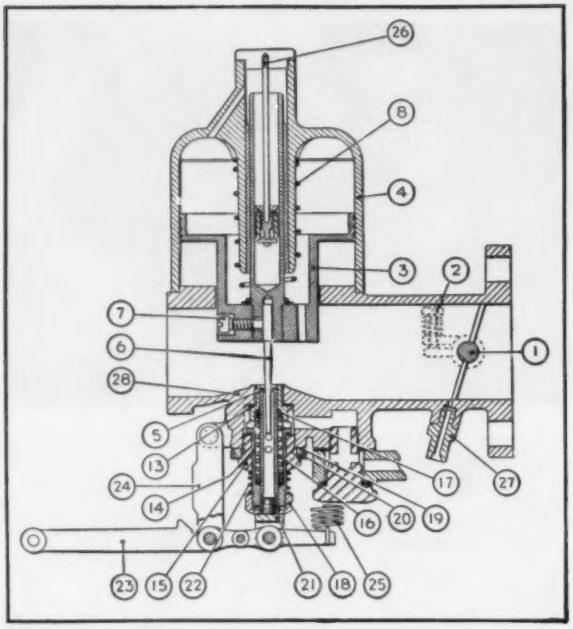
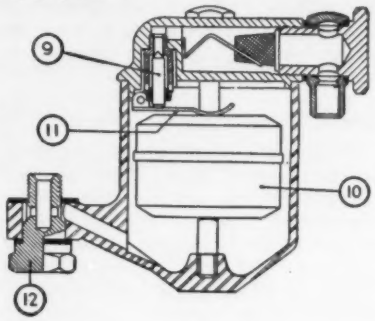


Fig. 5. (Left) Section through the SU carburetor: 1. Throttle valve and shaft; 2. Throttle stop screw; 3. Piston; 4. Suction chamber; 5. Jet bore; 6. Needle; 7. Needle locking screw; 8. Spring; 9. Float needle valve; 10. Float; 11. Float lever; 12. Float chamber attachment bolt; 13. Jet bushing (top half); 14. Jet bushing (bottom half); 15. Jet locking nut; 16. Compression spring; 17. Sealing gland; 18. Jet adjusting nut; 19. Sealing gland; 20. Conical washer; 21. Jet head; 22. Loading spring; 23. Jet lever; 24. Jet lever link; 25. Jet lever return spring; 26. Damper piston, rod and cap; 27. Distributor vacuum advance connection; 28. Bridge piece.

Fig. 6. (Right) Sectional view of float chamber. See tabulation under Fig. 5 for meaning of numbered parts.



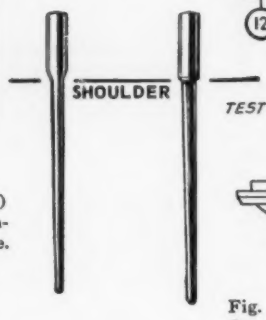


Fig. 7. (Right) Alignment for installing jet needle.

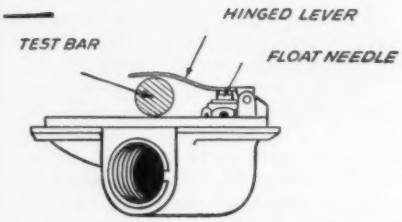


Fig. 8. Method of checking carburetor float level.

Triumph TR3 . . . CONTINUED

intake with any light instrument such as an ice pick and lift the piston slightly. This should make engine operation irregular. If lifting the piston about ⅛ in. on one carburetor stops the engine, and lifting the other about ⅛ in. increases the speed, this indicates that the mixture on the first carburetor is a bit lean and the second a bit rich. The first one should therefore be enriched by unscrewing (lowering) the jet adjusting nut (18) one flat at a time. To lean the rich, or second, carburetor, screw the adjusting nut (raising) one flat at a time. When the mixture is correct, the exhaust beat will be regular.

As a double check, listen closely to the exhaust. If there is a rather regular type of misfire together with black smoke, the mixture is rich. If the exhaust sounds irregular, but there is no smoke, the mixture is lean. Recheck after putting the air cleaners back on the carburetors.

When reconnecting the link between the jet levers of the two carburetors, press each lever firmly forward and adjust the rod so that the clevis pins may be inserted freely. Retighten the throttle clamp bolt while each throttle adjusting screw (2 in Fig. 5) is pressed down against its stop.

For special purposes the carburetor needles can be changed. In the Triumph TR2 models, a type H4 carburetor is used. The standard needle is F.V. When these cars are equipped with oil bath air cleaners, AH needles should be installed.

On the Triumph TR3 cars, the carburetors are the model H6. For normal and competition work, the needle should be S.M. When these carburetors are fitted with oil bath cleaners, the needle should be CIW.

It is not intended that the foregoing instructions should be used for complete carburetor overhauling. Complete literature on these carburetors may be had by addressing the S. U. Carburetor Co., Ltd., Wood Lane, Erdington, Birmingham 24, England.

DISTRIBUTOR SERVICE

The Lucas ignition distributor requires conventional service. The rotor should be removed from the end of the shaft and a few drops of light oil applied to keep the cam free to retard or advance. At this time the surface of the cam should be coated thinly with cam lube to retard wear on the moving arm rubbing block. The moving arm pivot should also be lubricated lightly, as should the pivot where the vacuum advance attaches within the distributor.

A basic timing setting calls for the breaker points to open at 4° BTDC. Contact opening should be adjusted to .015 in. Power timing is recommended by the factory. Using 95 octane (Research Method) fuel, a clean engine should not detonate on hard acceleration.

The basic setting of the distributor is accomplished as on most American cars, by turning the distributor in its clamp. To relieve ping, however, a fine timing adjustment can be made with the aid of a knurled screw being pointed to by the mechanic in Fig. 10. Actually the distributor cap would be in place while this distributor adjustment is being made.

The engine is checked under hard pull from 1,500 r.p.m. upward. Turning the knurled nut to the right retards the spark, to the left advances it. Each division of the distributor Vernier scale represents 2° of the distributor—4° on the engine crankshaft.

Top dead center position of the crankshaft can be determined by aligning a small hole in the belt pulley with a pointer that is attached to the timing cover. Incidentally, 4° is equivalent to 3/16 in. measured on the circumference of the crankshaft fan pulley.

Should tune-up reveal the need of valve service, there is one precaution —*do not crank the engine after removing the head.* A glance at Fig. 11 shows the reason for this warning. The cylinder sleeves are relatively

Fig. 9. Carburetor installation, showing how throttle shafts are held together by two-bolt clamp (A).

Fig. 10. Mechanic pointing to knurled screw on distributor which is used to obtain fine timing adjustment.

loose when the head is removed. While it is not likely that the sleeves would actually pop out if the engine were cranked, there is a good possibility of their loosening and subsequently, water might work down into the crankcase.

Should it become necessary, in connection with any engine work, to crank the engine while the head is off, a few small pipe nipples and washers can be arranged over the cylinder head bolts so that the sleeves will not move.

A good valve job on the Triumph follows the approved practices that apply on any conventional overhead engine. So, space will not be taken at this time to go into detail other than to point out that more torque than many mechanics would suspect is applied to the head bolts. Final torque of 105 ft.lbs. is specified. The sequence of torquing is shown in Fig. 12.

ELECTRICAL COMPONENTS

Important components of the electrical system are mounted in or on the firewall, shown in Fig. 13. As with any electrical system, so with the Triumph, the battery top and terminals should be kept clean and dry.

Generator cut-in speed should fall between 1,050 and 1,200 r.p.m. Cut-in should be adjusted to 12.7-13.3 volts. Maximum output of the generator is 19 amps. at 1,900-2,150 r.p.m. at 13.5 volts when checked at the generator.

Regulator adjustment is controlled by adjusting the nuts and bolts at the side of the regulator opposite the coils. The bright unit alongside the regulator in Fig. 13 is the flasher for the turn indicators. Below the regulator is the fuse block.

Brakes and clutch are hydraulically actuated. Each has its own master cylinder. Both master cylinders, however, are kept supplied with brake fluid by a single reservoir which the mechanic in Fig. 14 is filling. In the illustration the two master cylinders are partially hidden by the motor of the windshield wiper mechanism. Note that a flexible shaft extends from this wiper mechanism through the firewall to actuate the wipers themselves.

The two adjusting bolts held by lock nuts control pedal freeplay for both clutch and brake. Down under the car on the clutch is a hydraulic cylinder very much like a wheel cylinder. Instead of acting against a brake shoe, it acts on the clutch lever. The clutch pedal works on its master cylinder as a brake pedal would work against a master cylinder. If clutch action is spongy, the clutch hydraulic system can be bled like a brake system. There is a bleeder valve at the top of the clutch cylinder mounted on the side of the clutch housing.

Lockheed hydraulic brakes have been used on all four wheels until the introduction of the model TR3 in 1957. Since then front wheels have employed the disc brake, shown in Fig. 15. The disc takes the place of the brake drum, and the hydraulically

(Continued on following page)

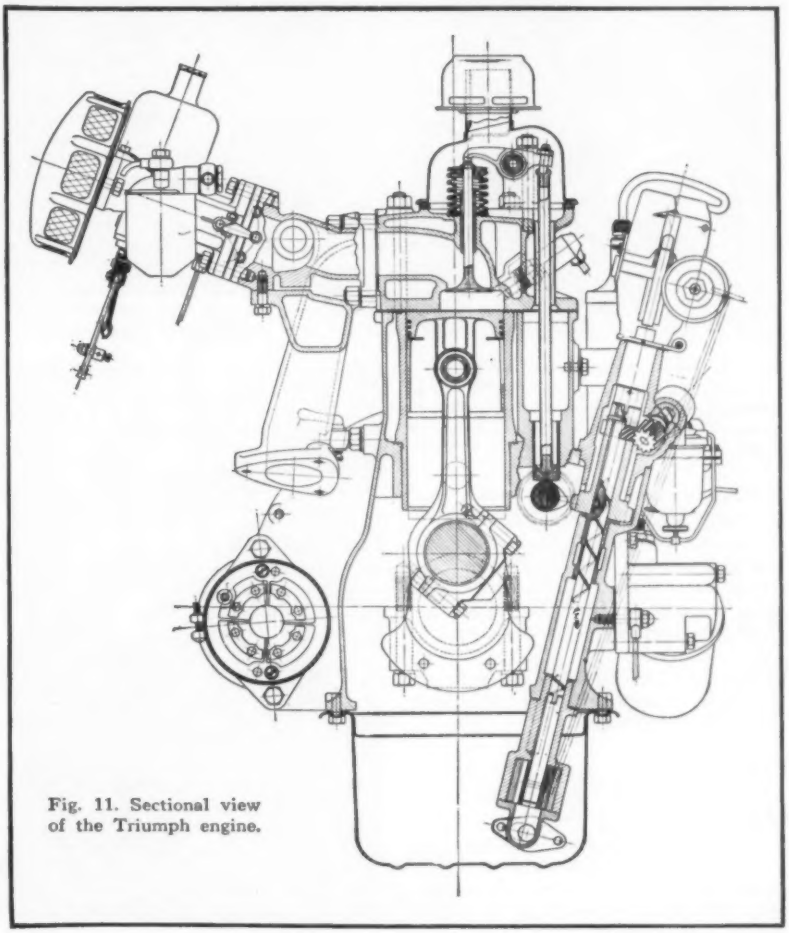


Fig. 11. Sectional view of the Triumph engine.

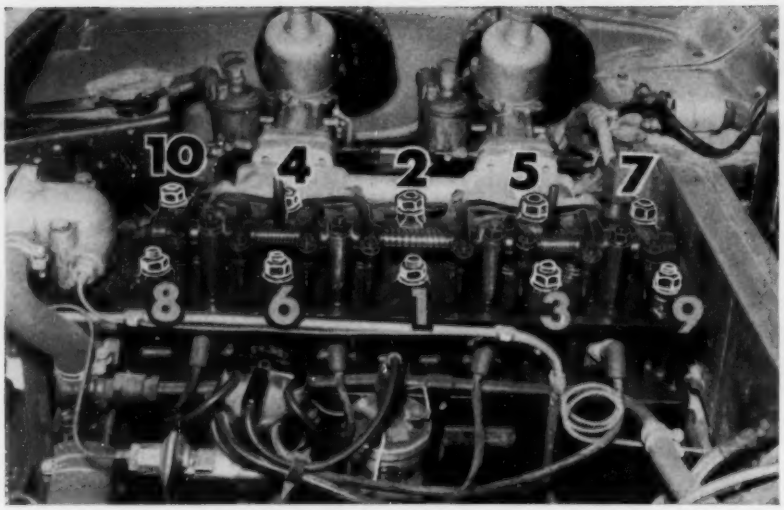


Fig. 12. Head bolt tightening sequence. Specifications call for a final torque of 105 ft.lbs.

Triumph TR3 . . . CONTINUED

applied frictional pads grip the disc near its outer edge.

Reduced fade even under repeated application from high speed, is the principal reason for going to this type of construction. There is the added advantage that these frictional pads can be changed quickly. Some Triumph owners even carry spare pads along with their tool kit. When operating on wet highways, these brakes have been found to be a little slow in taking hold. But a little dragging of the brake in anticipation of their need meets this problem.

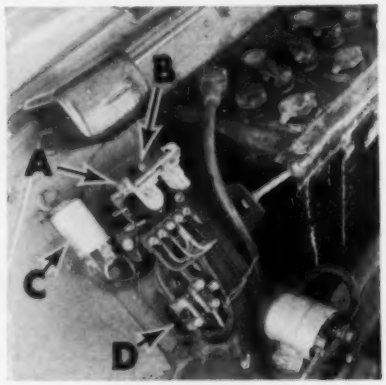


Fig. 13. Electrical components are easily accessible on Fire wall. A—regulator adjustment screw; B—cut out adjustment screw; C—turn signal flasher; D—fuse block.

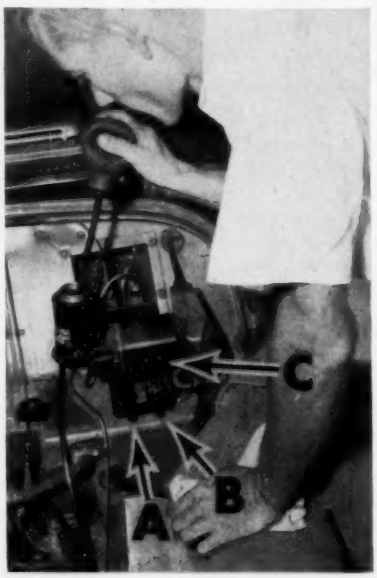
WHEEL BEARINGS

The satisfaction with which disc brakes perform is dependent upon correct lubrication and adjustment of front wheel bearings. Any rock or shake in the front wheel other than that caused by looseness of the front suspension upsets the relationship between the frictional pads and the discs. When adjusting the front wheels to be free of such rock or shake, note that there are two holes drilled at right angles to each other in the spindle. This allows adjusting the wheel nut to half a flat.

While shake or rock of the disc is objectionable, care must be exercised to avoid overtorquing the front wheel nut. The factory urges the following procedure:

A. Slacken off the adjusting nut two turns and rock the wheels in order to position each bearing against its end locations.

Fig. 14. Reservoir supplying fluid to hydraulically actuated brakes and clutch should be kept filled at all times to ½" of top. Brake and clutch free play adjustments are shown at "A" and "B" respectively; "C" is windshield wiper motor.



B. Slowly rotate the nut with the fingers until all wheel rock is eliminated.

C. Rotate the nut in a counterclockwise direction until a slot in the nut lines up with one of the two holes in the spindle. It will not be necessary to rotate the nut more than half a flat.

D. Insert and spread the cotter pin.

Later cars are changing over to dual brake fluid reservoirs. This is to protect the brake system from loss of fluid that might result if a leak developed in the hydraulic clutch system. Bleeding of the brake system with disc brakes is the same as the bleeding procedure with the drum brakes. It is necessary, however, to take off the front wheels in order to reach the bleeder valve.

Fig. 15. Bleeding the disc brake.

It Could Happen To You

You're trying to time an engine with your timing light and the timing marks flutter or "fan" at certain r.p.m.'s. You might get a variation of 4 or 5 degrees, making it impossible to do a proper tune-up.

Upon checking into such a complaint, Champion Spark Plug Co. engineers found the trouble was due to a worn distributor drive shaft slot. A worn bushing had allowed excessive clearance between the distributor and the shaft. Eventually, the drive slot became enlarged, thus permitting excessive "play" between the drive shaft and the distributor. Replacement of these worn parts permitted proper ignition timing, as well as increased spark plug life.

Moral: Always check distributor drive shaft spacer when doing a tune-up to be sure of proper clearance.

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Strictly Personal

By
A.S. DOUGLAS

True experiences concerning the problems of shop management as viewed through the eyes of an experienced automotive serviceman. Although the name of the author is ficticious, he has served as shop mechanic, foreman, service manager, car salesman and factory field representative.

(Opinions expressed by the author are not necessarily those of Automotive Service Digest.)

● CAN EMPLOYEES WORK too hard? Can you give them too much incentive to sell?

One shop did. Deciding that it would be profitable to up the sales of accessories, they offered employees a 10% bonus for any accessory that they could sell to a motorist who had come into the shop for some regular service.

Apparently the plan was wonderful. The shop had been quite busy and as the service salesmen began to push floor mats, seat covers, spotlights, windshield washers and such items, accessory volume and profit moved pleasantly upward.

But the next month showed a slight drop-off in shop volume. The third month the volume had dropped to a point where the shop owner and his service manager went into a huddle with themselves. Checking over the work being done, it was found that a number of their regular lube customers were apparently quite late in returning for regular service.

So the shop owner played a hunch. He phoned one of his regular customers who was also a personal friend. In the course of the conversation, the former customer admitted that "he couldn't afford" to get his car lubricated there anymore. He admitted that the charge for the lubrication job was quite in line. He was pleased with the service. He had great confidence in the thoroughness of the boys. Then he said, "I'm delighted with the spotlight that I bought three months ago. And the seat-covers and floor-mats that I bought the month after that really dress up the car—but I just can't afford it."

So the boss saw the handwriting on the wall, and issued these instructions—"Point out every service *need* to your customer and *show* them the advantage of our accessories, but *leave the buying decisions entirely with the motorist himself. No high-pressure selling* will be permitted."

From then on a nicely illuminated, well-arranged accessory exhibit did very well, and in time the sincere selling of *needed* service re-established shop volume on a profitable level.

KEEP AN EYE ON THAT BEGINNER

● BERT, THE NEW SHOP HELPER, was unhappy. Vainly he searched through the first aid cabinet for bandages to cover his skinned knuckles.

"That's a laugh," he remarked. "Adjust brakes without bleeding. And look at me."

Bert was a good kid. He had the benefit of an auto shop course at high school. But he lacked maturity and judgment. For a few months he had been working on the lube rack, and among other things did an A-1 job of repacking and adjusting front wheels. That was good, as far as it went.

Having made a couple of successful minor brake adjustments, his ambition got the best of him when the repair order read, "Repack front wheels and adjust brakes."

For no good reason he decided to remove and replace the brake shoe return springs. And he tried it with a pair of diagonal pliers. It was bad on the diagonals, rough on the springs, and worse on Bert.

Springs removed and replaced with such cutting tools as diagonals are subject to early failure. And when a spring fails it may do expensive and dangerous damage to the brake drum and other parts. Brake shoe springs should never be handled except with regular spring servicing tools. But this was a detail that was new to Bert.

Mechanic shortages are resulting in more and more helpers being hired in service shops. And it hardly need be pointed out that such helpers lack experience and training. They may mean well, but being young are too inclined to take a chance. Still you can use these young men to their advantage and yours if you keep them under constant observation. They must be constantly impressed with the fact that the fellow who built the car knows far more about it than they do. That should be self evident, but it seldom is.

These beginners must be encouraged to follow shop manuals or other authentic service information on every job they do. With such help and your observation they will grow to become competent service mechanics. And everyone knows that America's future economic and even military strength is dependent to a great degree upon our supply of good mechanics.

Watch How You Replace Distributor Cap When Servicing Chrysler Distributor

Should you experience a condition which is apparently pre-ignition when starting Chrysler engines (such as: bucking, kick-back, or failure to crank), the factory states that it may be caused by loose or incorrectly located distributor cap retaining clip brackets.

The location of the distributor cap radial contacts in relation to the distributor rotor contact segment is such that it must allow for the change of timing due to the vacuum advance mechanism. Hence, the location relationship between the distributor cap contacts and the distributor rotor is critical and must be maintained.

Inasmuch as the cap retaining clip bracket index locates the distributor cap, it is imperative that the distributor cap retaining clip bracket be correctly located and tightened securely.

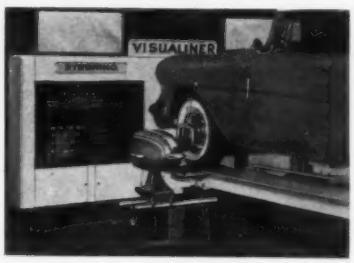
If the retaining clip brackets are loose or incorrectly located, the distributor cap to rotor relationship is changed and with the changes due to point and breaker arm rubbing block wear, can cause cross-firing of the plugs and later bucking, kick-back or failure to start.

WHEEL ALIGNING NEWS

VISUALINER John Bean STEERING SERVICE

Getting New Profits Out of Old Equipment

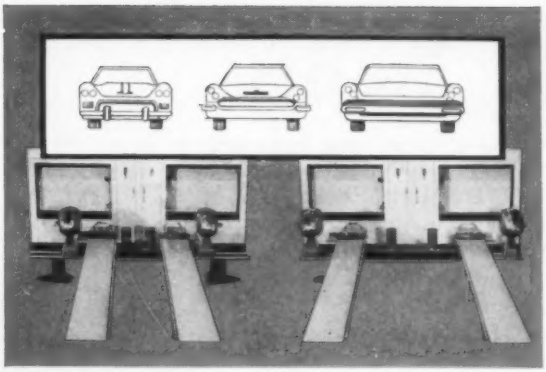
With car registrations reaching a new high every month, the capacity of automotive service facilities is being stretched to a breaking point. To keep abreast of this swelling demand, service operators are faced with two choices: (1) purchase additional property to build larger facilities, or (2) modernize their present equipment to increase efficiency. Figures show that 90% of today's aligning operators can add 50% more capacity to their present equipment through modernization. In other words, modernizing can add the equivalent of 100 feet to a 200-foot service area . . . at less than 5% of the building cost! Many ways to modernize your present equipment are suggested on this page . . . many ways to increase your capacity, and get new profits out of old equipment.



One sure way to add new and profitable efficiency is to add Visualiner projection heads and viewing screens available as a changeover unit that is readily adaptable to practically any wheel alignment or frame straightening rack. With Visualiner, the most modern of all wheel aligning methods, you get speed and precision that is unsurpassed. You make all readings in a fraction of the time required with other methods, and perfect corrections are achieved without trial and error. If you are already a Visualiner owner, you will want to investigate the new remote chart controls, easily added to your present unit.

Cut Aligning Time 20%

John Bean's exclusive remote control steering wheel turner adds still greater speed and accuracy to wheel aligning service, cutting time as much as 20%. Manual effort is replaced with automatic control that allows the operator to turn front wheels instantly. Working under the car, over the fender, or standing on either side, he has finger-tip control at all times. Errors resulting from pushing or pulling the wheels are completely eliminated.



Service Any Car, Any Tread Width

Now you can broaden the range of your wheel alignment service to handle virtually all types of cars, including foreign cars of every make, sports cars, passenger cars, and light trucks. All this with a single rack . . . with adjustable runways that move in or out to fit any tread width from 40 to 68 inches. With John Bean universal racks, you not only serve more customers, but you serve them faster. Investigate the conversion of existing Visualiners through installation of the new John Bean adjustable rack. They can be installed economically to utilize existing Visualiner heads and backgrounds.

Many New Tools and Accessories Increase Aligning Efficiency

John Bean now offers many ways to speed aligning service and increase your capacity with minimum investment. One of these is a handy set of steps that attach directly to your aligner for new comfort and convenience in making over-the-fender adjustments. Portable foot-operated air jacks can be added that lift cars instantly in preparation for steering and alignment checks beneath the car. For late-model Chevys, Buicks, and Chrysler cars, new camber correction tools let you increase camber after all shims have been removed. Torsion-Aire suspensions are quickly and accurately adjusted with the new John Bean Model 54 Suspension Height and Level Checking Gauge. These and many other tools and accessories, essential to a complete, modern department are all available from John Bean.

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Making a proud debut to the sales arena last month, the 300E bowed-in with distinctive exterior styling. It features racing-type, funnel-shaped grille, one-tone paint, function trim; and is the all-time . . .

Most Powerful Chrysler

• FIFTH IN A SERIES of high-performance cars, the 1959 300E is described by company engineers as the most powerful Chrysler ever built. According to R. M. Rodger, chief engineer and director of product for the Chrysler Division, the new sports-type car provides higher accelerating thrust than any other U. S. production automobile.

Its completely redesigned 90-degree V-8 power plant has 413-cubic inch displacement. Equipped with twin-carburetors, the new engine develops 450 pound-feet of torque at 3600 rpm; delivers 380 horsepower at 500 rpm. Although this compares with maximum rated 380 hp for the 300D of last year, which had an engine of 392 cubic inch displacement, Rodger points out that the '59 outperforms the previous model in acceleration. The new engine, he emphasized, provides more punch in the low and medium speed ranges.

EXCITING ROAD CAR

Suspension has been designed for handling characteristics considered desirable in a powerful automobile. High rate chassis springs and heavy-duty shocks, in combination with a low center of gravity, are said to enable the 300E to corner with negligible body sway or tire squeal, and to give the driver the "feeling" of being part of the machine.

Adding to the solid feel in all types of driving, and said to contribute to excellent high speed fuel economy, are special racing tires. They combine nylon construction and low cord angle to reduce sidewall deflection, and a special tread stock; features which are claimed to result in increased tire strength and lower operating temperatures. Because of its great power and speed, Rodger believes, the new model will facilitate safer highway driving. "It will mean less exposure to oncoming traffic in passing and to cross-traffic at intersections," he said, "and smoother blending with expressway and turnpike traffic."

Proving ground tests show that the 300E accelerates approximately 10 per cent faster than its predecessor model: going 0-30 mph in 3.4 seconds, 0-60 in 8.3. Engine features that contribute importantly include a full-race camshaft, special intake and exhaust systems.

NEW

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Exhaust Gas Analyzer
Tach-Dwell Meter
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diagnose troubles quickly, easily, positively

at low cost

These *Snap-on* testing sets put you in the car and truck-servicing business with real authority — give you a packaged unit for diagnosing engine and electrical system troubles accurately in a hurry.

Any mechanic can use this equipment effectively with just a little instruction. Fully illustrated booklets make it extra simple. Each tester has a minimum of adjustments and connections. No outside power needed. Each tester is a complete unit in itself — can be removed from the rack and used anywhere in the shop or on the road. Save stall space for other work.

Roll stand easily holds all four testers in test racks. Two large compartments in roll cab give you extra storage space.

YOURS ON EASY PAYMENTS

It takes modern equipment like this to service today's complex cars and trucks properly. And the profits are big, the investment small. You can own this complete MT-4000A set for just a little down, a little each week. Ask your *Snap-on* man the next time he calls.

MT-405A Exhaust Gas Analyzer — Checks the air-fuel ratio — shows you if engine is operating efficiently; if carburetor is set properly. Use on any gasoline or liquid petroleum-type engine with single exhaust pipe. Flexible sampling tube and tail pipe adapter fits all cars — attaches securely to bumper on road tests. Completely self-powered. Carburetor idling adjustments can be made without dynamometer.

MT-415A Tach-Dwell Meter — Tach scale checks engine rpm for servicing automatic transmissions, balancing cylinders, adjusting carburetor idling jets. Dwell scale is used to check dwell or cam angle and resistance of breaker points; set breaker points. Use on 6, 12, or 24-volt systems.

MT-401A Generator-Regulator Meter — tests the generator, checks regulated amperes, cutout and regulated voltage. It is also used to test battery and locate electrical leaks. Has 15-volt range for cars and trucks and 60-volt range for ignition systems of more than 12 volts.

MT-430A Ignition Analyzer — quickly and accurately tests primary coil efficiency; secondary coil efficiency; coil heat; stalled motor coil current: capacitor efficiency; secondary coil resistance; capacitor leakage; tests 0 to 1.5 amperes; tests 0 to 6.0 amperes; coil polarity; ignition efficiency; plug misfiring; ballast resistor continuity; general continuity; motor idle current; tests 0 to 300,000 ohms and tests 0 to 3 megohms.

MT-4000A Set — four meters, two tune-up meter racks and heavy-duty roll stand — a complete low-cost test center on wheels.

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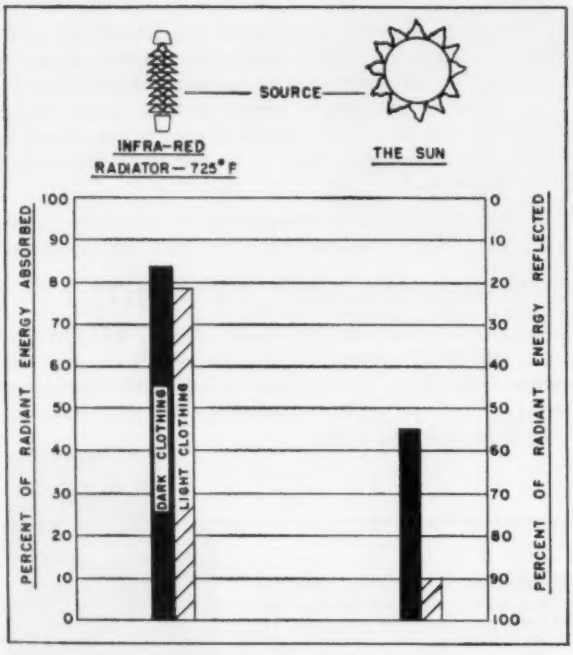
Infra-red shop heating

Radiant energy passes through the air to warm floors, equipment and mechanics. After the primary radiators have been in operation for a time, the floor and equipment become secondary heating surfaces . . . no blowers to stir up dust or fumes. Energy is directed where it's needed.

By T. K. LAU
Chief Engineer, Thermobloc Division
Pratt-Daniel Corporation

• GOOD WORKMANSHIP, with overall shop efficiency can result when mechanics are provided with comfortable working conditions. In cold weather, especially the shop working area must be kept at a temperature warm enough to insure comfort for the shopmen. Mechanics whose hands are warm, who don't mind getting "down under" on a warm, dry floor. Those who handle equipment that's at room temperature, are more likely to turn out precision work in zero weather, than mechanics in poorly heated, cold, shops. Good craftsmanship is difficult in a cold, clammy shop atmosphere.



Comparison of radiant energy absorbed by clothing for low temperature infra-red and sun radiation. In the near infra-red region (the sun) clothing color has a great effect on absorbtion of energy. Under the long wave length of the infra-red unit discussed in this article, clothing color has little effect on its absorbtivity.

As with constant improvement in shop equipment and procedures, so we find improvement in apparatus for heating shops and garages. Just as power-driven tools have displaced hand tools, so old shop heating methods are giving way to the new. Thus, instead of steam, hot water or hot air, new methods such as infra-red energy heating, for example, are gaining favor in many shops.

Infra-red heating in itself is not new. Centuries before man used fire as a heat source, the sun's infra-red energy traversed millions of miles of empty space, at the speed of light, to warm the earth and its inhabitants. In fact, infra-red radiation—the sun—was the first heating source known, to man.

Infra-red warms in the same way as the rays of the sun. Fast-as-light infra-red waves can warm individuals, equipment and shops, especially the floor itself, by guided radiation.

The infra-red heating apparatus shown in the accompanying illustrations is the "Panelbloc," which uses any commercial type of gas fuel. The combustion gases produced pass through a steel panel heat exchanger. Both the inside and outside of this heat exchanger are coated with vitreous enamel developed for extremly high heat and the enamel is temperature and corrosion resistant. The panel is heated to a controlled temperature for producing infra-red heat waves approximately ten times as long as those produced by a glowing fire. This heat is gentle, yet, due to its wave length, penetrates to a greater depth than visible radiant heat. The heat waves from the panel are then deflected downward directly to the area and individuals to be heated.

FUNDAMENTALS OF INFRA-RED

The transfer of energy through vast space illustrates one of the basic characteristics of infra-red. This wave form of energy doesn't contribute heat until it is absorbed. Thus, since space and to a lesser extent air, is a poor absorber, there are minimum energy losses during the travel from source to absorber. The temperature rise of the recipient of infra-red energy is determined by the absorptivity of the material upon which the energy falls. The greater the absorptivity the higher the temperature rise in the object.

The separation of the infra-red region of the spectrum

into near infra-red and far infra-red is important, since most materials found in industry absorb the longer wave length most readily. In the near infra-red region (the sun) the color of clothing on an individual has a great effect on the absorption of energy. While under the long wave length of the gas-fired infra-red heating unit, the color of clothing has little effect on its absorptivity.

Man has only recently learned to manufacture and utilize sources of infra-red energy other than the open fire and the sun. Many such sources are now marketed, mostly in the near infra-red (infra-red bulb). Much of their energy sources is wasted in the visible light wave lengths. Since any glowing object emits visible light, it is obvious that to get entirely into far infra-red the temperature of the source must be below the temperature of incandescence. In our Panelbloc this has been accomplished by operating at a source temperature of 725° F.

Losses due to convection of heated air are slight when using the Panelbloc as an infra-red energy source, since air is a relatively poor absorber. The radiant energy passes through the air to warm floors, people and machinery without creating any air movement; and it is not affected by drafts. After the primary radiator has been running for a certain length of time the floor and machinery become secondary heating surfaces.

Infra-red energy conforms to many of the laws of visible light. It can be concentrated and reflected by non-absorbent surfaces, and thus can be directed to a predetermined area. Spot heating in large open buildings is therefore possible without the necessity of installing costly partitions. Dust laden air is not stirred up; therefore particles may settle out, decontaminating the air. Energy travels from its source until absorbed at 186,000 miles per second; so no blowers are necessary.

EASE OF INSTALLATION AND MINIMUM OF MAINTENANCE

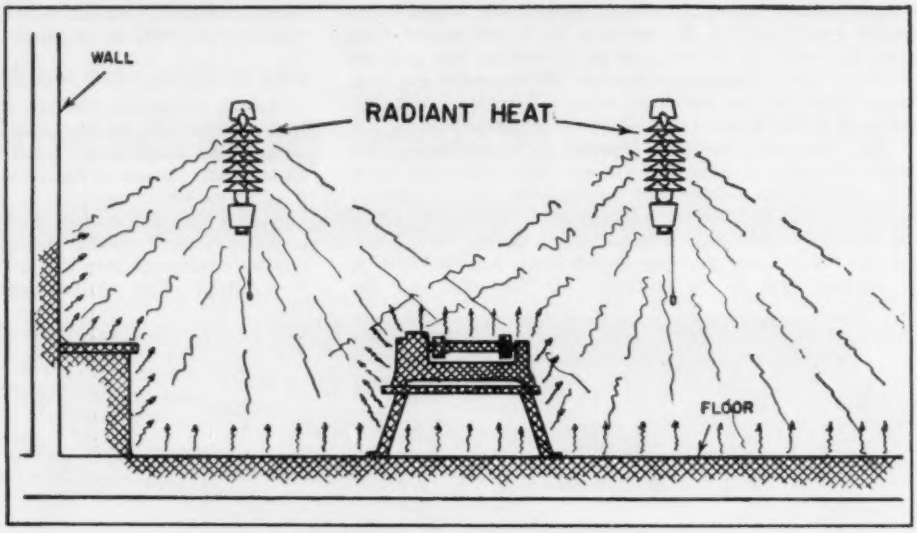
In the Panelbloc, the hot flue gases pass through the heat exchanger by tortuous path, so that maximum wiping and therefore heat transfer take place. Vitreous enamel was chosen as the heat exchanger surface because it is an excellent radiator of infra-red energy, is highly corrosive and temperature resistant. Aluminum reflectors completely surrounding the heat exchanger, reflect the energy downward into the working area where the heat is required. The control system consists of a manual gas cock, a pilot cock, a gas pressure regulator, a diaphragm gas valve and a constant burning pilot.

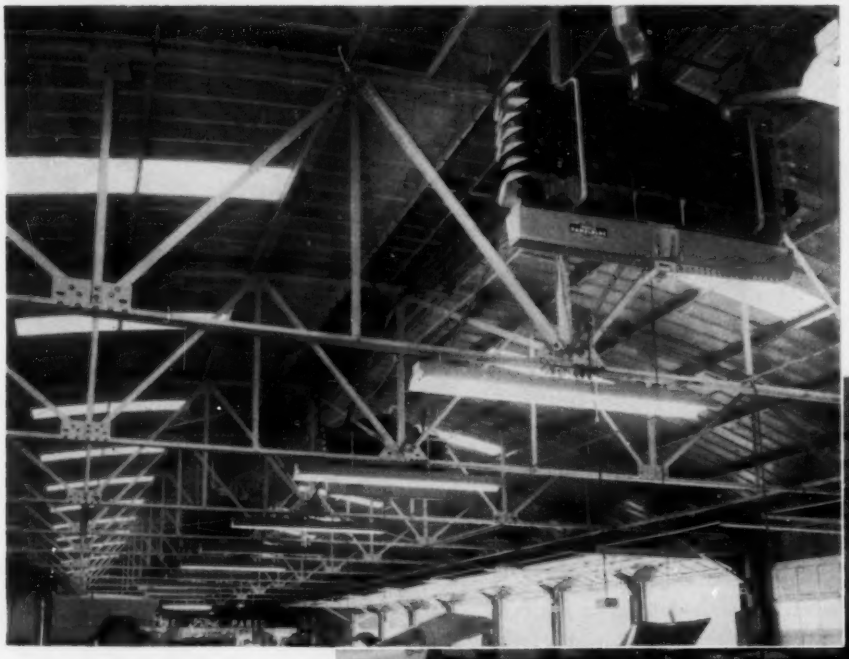
To simplify installation, the gas pilot is of the self-energizing type. By use of a thermopile in the gas flame of the pilot, enough electrical energy is generated to operate all the electrical controls of the unit itself. This reduces the cost of installation and operation, since no electrical power connections are necessary to the unit. The unit needs only to be hung on chains or rods, a gas line connected to the manual gas valve and the flue pipe connected from the downdraft diverter to the chimney, to complete installation. Since there are no moving parts, maintenance is at a minimum.

To determine the number of overhead infra-red heaters necessary to heat a shop or building adequately, an accurate analysis of local conditions must be made. The manufacturer of Panelblocs calculates the number of units

Mechanics who may have to work under cars can do so on the warm floor of this service area. Concrete is a good absorber of long wave infra-red energy as generated by the battery of heaters shown suspended from the overhead steel beams.

Illustrating primary heat by direct radiation. Secondary heating (of air) by conversion from floors, walls and materials which have been warmed by direct radiation.





Customers and mechanics alike are comfortable in this service area. The overhead infra-red heaters are safe, since they have no blowers to stir up heavier-than-air gasoline fumes.

Heating this service department with its wall of doors, is said to be no problem for infra-red heaters shown. Radiant energy goes where directed, unaffected by drafts or other air movement.

necessary in three basic steps.

Step 1, involves heat loss (in BTU s) in the normal manner—roof, glass, doors, walls and infiltration.

Step 2, considers the BTU heat loss, neglecting the heat loss through walls above 15 ft.

Step 3, determines the number of Panelblocs by the area method based on available curves of past experience.

It is readily apparent that this type of heating must be tailored specifically to the size and type of building. Various factors must be considered. For example, if a building has a wet sprinkler system above the height of the heater units additional heat would be required to maintain the sprinkler system above the freezing point.

HEATING CERTAIN AREAS ONLY

Of course, in many service shops, only certain areas need be heated. Most mechanics work on cars at a certain location, the rest of the building being used for storage. When this is the case, Panelblocs are located so that the area, used by the mechanics, is blanketed by direct radiation from the unit. The rest of the garage or service area is left unheated—so that additional fuel savings can be realized.

When designing a new building for the service area, construction costs can be minimized by the fact that insulation is not necessary with these infra-red heaters. When the heaters are installed according to the area method, the construction of the building or the insulation has very little effect on the total number of BTUs required to heat the working area comfortably. Incidentally, in the showroom area of automobile dealers the feature of no air movement is important. If the heaters do not disturb the air, they do not cause dust to fall on the newly waxed cars. Therefore, labor to keep cars looking their best is cut.

Cost savings from Panelbloc heating over conventional heating systems is greater in a building in poor condition than it is in a new well constructed building, because the difference between the number of the BTUs required by the area method and the total BTU loss, increases as the heat loss/sq.ft. of the building increases.

Fire inspectors in many locations proclaim the infra-red heater as safe for shops and service stations. It has been found that many explosions and/or fires are caused by the heating unit blower picking up the gasoline fumes and passing them through the fire. Since there is no movement of air toward the Panelbloc, no gasoline fumes are picked up from the floor to become ignited by the unit.

Eliminating Part Throttle Spark Knock On Dodge 315 cu.in. Truck Engines

Although a good grade of recommended fuel is used, part throttle engine spark knock may occasionally be encountered on the Dodge 315 cu.in. double rocker shaft engine.

To correct the condition, a recent Dodge Truck Service Bulletin recommends that the vacuum curve be changed by inserting a special .065" thick, calibration washer (Part No. 691710-P) under the large hex nut on the vacuum chamber of the distributor. When removing the hex cap, however, care must be taken not to lose the other spring loaded calibration washers under the cap.

Calendar of Automotive Events

1959

Jan. 17-25—Chicago Automobile Show, International Amphitheatre, Chicago, Ill.

Jan. 31-Feb. 4—National Automobile Dealers Assn. Convention and Equipment Exhibition, Conrad Hilton Hotel, Chicago, Ill.

Feb. 2-5—Automotive Accessories Manufacturers of America Show, Coliseum, New York, N. Y.

Feb. 15-17—Motor and Equipment Wholesalers Assn., National Convention, Conrad Hilton Hotel, Chicago, Ill.

Feb. 15-17—Automotive Affiliated Representatives Meetings, Pick-Congress Hotel, Chicago, Ill.

Feb. 18-21—Automotive Service Industries Show, Navy Pier, Chicago, Ill.

Feb. 27-March 8—World Wide Auto Show, Miami Beach Exhibition Hall, Miami Beach, Fla.

March 11—MEWA Western States (PAS) Conference, Fairmont Hotel, San Francisco, Calif.

March 12-15—Pacific Automotive Show, New Brooks Hall, San Francisco Civic Auditorium, San Francisco, Calif.

May 3-8—Top Management Institute, Motor and Equipment Wholesalers Assn., Allerton House, University of Illinois, Monticello, Ill.

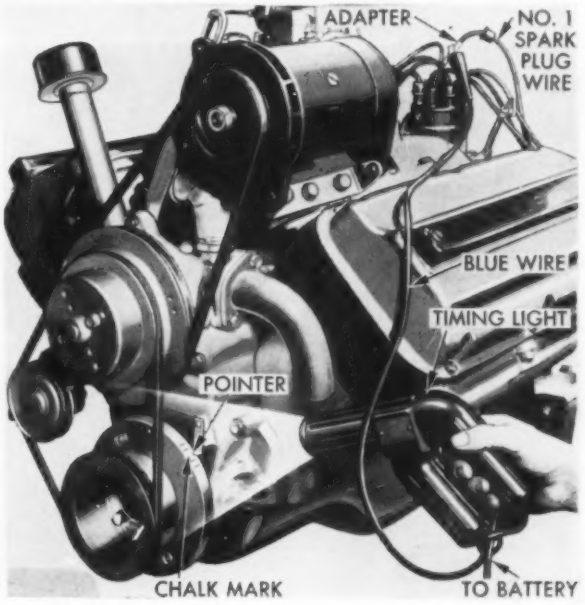
June 24-27—Independent Garage Owners of America, Inc. (IGOA) National Convention, Albany Hotel, Denver, Colo.

Easier Way to Correct Timing Light

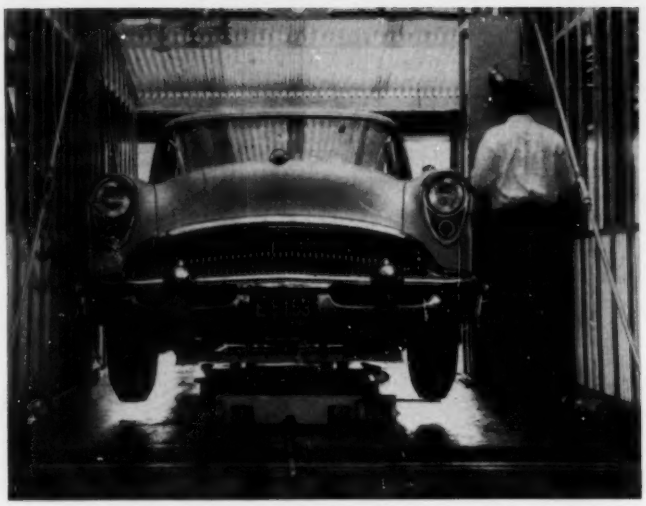
Perhaps it's just habit that makes us want to connect our timing light to the spark plug of #1 cylinder. And it's definitely bad practice to "bite" the number one spark plug wire insulation in order to operate the light.

The approved method of connecting the timing light is seen in the accompanying illustration. Just pull #1 spark plug wire out of the distributor cap, put in the adapter as shown, reconnect #1 spark plug wire to the adapter, and hook up your light. It's quick, easy, and harmless.

Approved manner of connecting timing light when No. 1 spark plug terminal is not easy to reach.

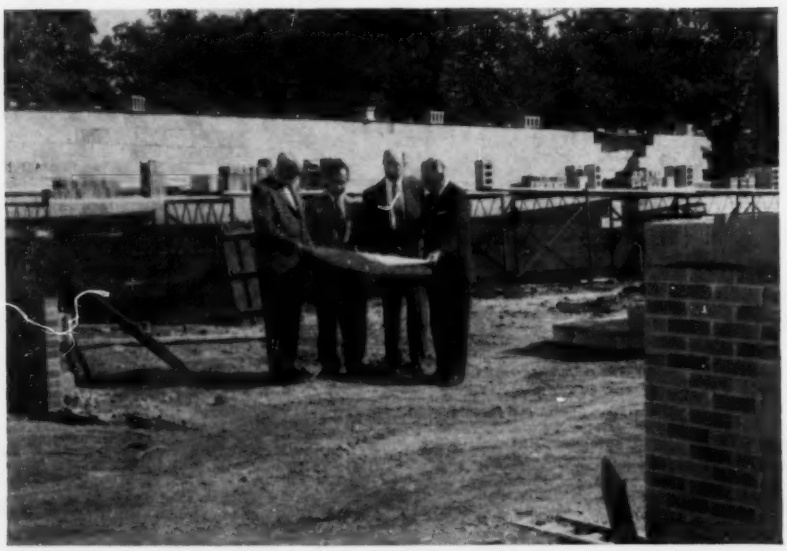


Right, the E-Z-C Auto Memo Holder to meet the needs for making notes and memorandums while driving. It's fastened to upper molding of the instrument panel by using one removable Phillips screw.



This car elevator, in a new Parkersburg, W. Va., multi-level garage is protected from rain, wind and dust, yet kept bright through fiberglass reinforced plastic panels for roof, valance and railing.

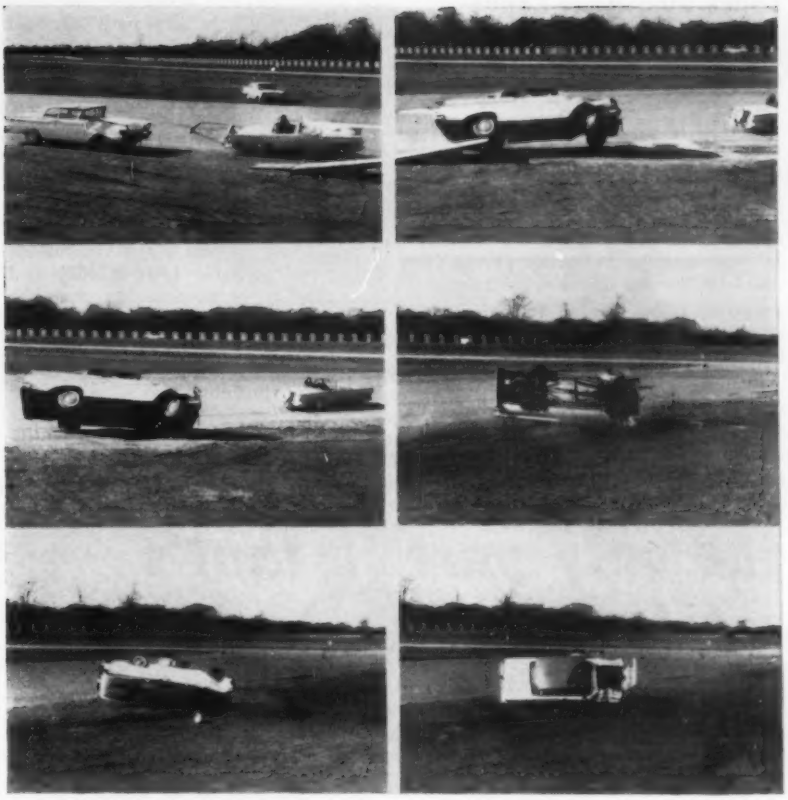
Available on '59 Pontiac speedometer is a warning device that can be set for any speed over 15 mph. When selected speed is reached, driver is warned by a pleasant audio signal as well as by a signal light.



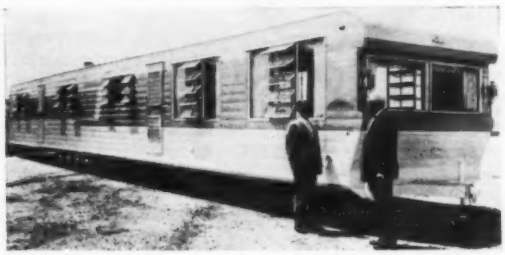
Teamwork in Automotive Service Education—Representatives of the Ohio State Department of Education and the National Parts Association confer at the site, on placement of automotive shop equipment in the New Philadelphia, Ohio, school building. Left to right: T. B. McConnaughy, N. E. Ohio assistant supervisor of the State's Vocational Division Trade and Industrial Services; S. N. Guckenheimer, local Director of Vocational Education; Henry Fickes, Reliable Auto Parts, of NSPA, and Mel Turner, Curriculum Director of the NSPA Vocational Schools Program.

PHOTOS

from here and there



At Ford's Research and Engineering Center, "roll-overs" test vehicle body strength. Key to the project is the "mouse-trap" (top right) which cramps the wheels full right because car won't roll, says Ford, unless this is done. In test, safety door latches kept doors shut.



Left, said to be longest trailer coach ever built—68 ft. long, 10 ft. wide. Has two bed rooms and two bathrooms. It was made for the deputy transportation director, White Sands Missile Range, N. M.

Shown at the recent Chicago Convention of the American Finance Conference was this 1930 Buick sports roadster. It has a Master 6, 79 hp. engine, rumble seat, trunk rack.

No, you're not seeing things. The officer actually is giving this Houston, Texas, salesman a speeding ticket—62 mph in a 30-mile zone. The car? A Cadillac sport roadster of 1910 vintage.

Spark Plug Heat Range

Spark plug requirements and specifications have changed considerably on many cars in the past few years. For this reason it is advisable to review one of the basic factors in spark plug recommendation—that of "heat range." Too many motorists (and some mechanics, too) still think of a "hot" plug as one which gives a hotter spark. This lack of knowledge has caused trouble for more than one motorist, for too hot a plug can cause detonation or even preignition, which sometimes results in serious engine damage.

By the same token, too cold a plug causes premature fouling and usually results in power loss. *Heat range actually refers to the ability of a spark plug to conduct heat away from its firing tip.* The accompanying diagram shows how the path of heat flows in hot and cold-type plugs. The heat travels up the center electrode and through the insulator to the shell (and then through the plug seat to the cylinder head). The main difference between the hot and cold plug is the distance through which the heat must travel to be dissipated. The further it travels, the hotter the plug.

Spark plugs with a short insulator firing end transfer heat rapidly and are used when combustion chamber temperatures are high, such as in a high speed, over-the-road operation. Where operating conditions are prone to cause fouling, a hotter design is used. In this case the heat retained within the plug tends to burn off the carbon deposits before they can cause fouling at the tip.

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The Engineered
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All you'll ever find in the Brake Parts Line is Safety-Engineered Parts designed for maximum stopability. Nothing has been left to chance—nothing has been left undone.
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BRAKE CABLES

Instrument Corner . . .

(Continued from page 37)

sion."

The shop man went on to tell Jim that he had tested the indicated cylinder with the compression gauge and found that it was about 20 lbs. under the rest of the cylinders. He had recommended a valve job to the car owner but had not received authorization to do the job up to that time.

"How do you *know* that the engine needs a valve job," Jim asked. "You know it could need a ring job; and how do you know whether the intake or the exhaust valve is causing the low compression?"

The shop man did not have an answer to these questions, so Jim said, "Let's find out what is really causing the low compression. I have a cylinder leakage tester in my car."

Checking the indicated cylinder with the cylinder leakage tester showed a 28% leakage through the intake valve. This was determined by listening at the carburetor with the air cleaner removed at which point a loud hissing noise due to escaping air was heard. Listening at the end of the tail pipe for possible leakage past the exhaust valve, did not reveal any hissing noise, indicating no exhaust valve leakage. Listening at the oil filler tube with the air cleaner removed revealed a small amount of leakage past the rings.

The compression, as shown by the compression tester on the defective cylinder was 100 lb. while the rest of the cylinders were 115 to 120 lbs. In this case the results shown by the compression tester and the cylinder leakage tester were quite consistent, but it frequently happens that their indications do not agree very well. When this is the case the cylinder leakage tester should be considered to be more reliable than the compression test results.

Intake valve trouble usually arises from a build-up of carbon on the valve seat or valve face so that the valve does not seat properly. This allows the extremely hot gases to blow through the crack between the valve face and seat, which burns the valve and makes a serious leak. The intake valves are not as resistant to high temperatures as the exhaust valves and therefore when a condition of poor seating is present, it is not long before the valve begins to burn.

Almost any shop where they have some testing instruments could have found the trouble in this case, but the reason for bringing this true story to your attention is to point out the value of the oscilloscope as a diagnosis instrument.

• THE INSTRUMENT MAN dropped in for lunch at his favorite restaurant, where a couple of his "boys" also ate frequently. He hoped to meet them and his hope was fulfilled when he saw them sitting at a table over in the corner, with an empty chair apparently waiting for him. His boys, as he liked to call them, were fellows who had started shops of their own and had bought their equipment for testing and tune-up work from him. He had instructed them and coached them, and was quite proud of the way they had built up their respective businesses and the quality of work they were doing.

"Hi, Jim" they greeted him. "We sort of thought you might drop in. Glad you did."

"Anything interesting come up lately?" Jim asked, to which they both replied, "I had one for the book a couple of days ago."

"OK, Bill, let's have yours first," the Instrument Man said, so Bill told this experience:

12 SETS OF POINTS IN 6 MONTHS

"The owner of a 1955 Chevrolet Six had been having trouble with the contact points in his distributor burning out frequently. In fact he had replaced 12 sets of points in the last six months, which was pretty expensive, and he was thoroughly disgusted. You can't blame him for feeling that way because he had taken his car to several different shops and they didn't help him a bit.

"In one shop the voltage regulator was replaced and he paid for that. In another shop, they told him his regulator needed adjustment, so they checked and adjusted it (they said), but that didn't help the situation. A week later he needed new points again, and the shop which put in the points sold him a new breaker plate. Two weeks later he needed new points once more.

"He happened to pass my place and saw my sign, Scientific Diagnosis and Tune-up, so he stopped in to see if we could help him. He told us all about his experiences. His opinion of automobile service shops was sure down to zero."

"Don't tell me what you did," the Instrument Man interrupted, "I'll tell you! You got out your voltmeter and connected it to the battery side of the coil and to ground, with the engine running, and checked the voltage at this point, And you found that it was over 12 volts, which told you that the by-pass circuit for starting did not cut out when the starting circuit was broken, and the ignition system was getting a full 12 volts or more instead of the 9 volts or so that it should get with the ballast resistor in the circuit."

"Yes, that's right," Bill said, "But how did you know?"

"Knowing that this was all it could be, unless the voltage regulator was way off, and knowing that you make good use of your voltmeter, what else could it be?" Jim answered, "I'll bet the car owner was tickled and that you made a new customer for yourself, right?"

"Right!"

"And now Ferd, let's have yours!"

"Mine happened to be a Chevrolet also, a 1957 V-8. I got a telephone call three or four days ago from a man who said he was referred to me by one of my old customers who liked the way we took care of him. The Chevy owner had just gotten through spending $60.00 on his car for a thorough tune-up, which included some new ignition parts, new points, plugs, condenser and so on. But after the tune-up the car ran just as poorly as it had before, and heated up on long hills. He took it back to the shop that did the tune-up, but they told him they had checked everything and there was nothing more they could do. He wanted to know if I would check it over and find out what the trouble really was.

"He brought it in that afternoon. I figured that the shop that did the tune-up probably checked the ignition system and adjusted the carburetor, so I thought I would check compression. I used the cylinder leakage tester on it, and guess what! Four of the intake valves had over 35% leakage. I told the owner to stay and watch the test, which he did. He saw for himself that the trouble was bad valves, so he authorized a valve job. We did the job the next day, and you know that we do our valve work according to the book, so it was a good job, if I do say so myself. When the job was done and the owner took the car out, he came back in about fifteen minutes just to tell me how swell his car ran. He sure was tickled.

"He didn't tell me the name of the shop that did the so-called tune up, but those boys didn't even take a compression test when the plugs were out of the engine. So they cheated themselves out of the valve job, on which we naturally made a profit; besides that, they lost a customer for good."

"Neither one of you boys deserves much credit for licking those two jobs," said the Instrument Man. "They were both too easy. But on the other hand, you were both on the job to do a thorough analysis and if the troubles had been hard to find, you probably would have spotted them, even if it did take a little longer than these two."

As they finished their pie, Jim added, "It sure is a pity that there are so many cases of failure to check jobs through completely. Cars drive off with badly needed corrections that offset all the good work that may have been done. When a car is not running right and the owner takes it to a shop to have it fixed, he wants it fixed all the way. Even if you do very excellent work on some things, he will be mad and disappointed if you don't fix the thing that troubled him—and if the car doesn't run noticeably better when he gets it back again.

"But you fellows know all that, and I know you are trying hard to live up to it. I hope we can get together next week again. Maybe you will have some real stories to tell me. So long, boys!" The Instrument Man got in his car and drove off on his afternoon calls, sadly reflecting on the two cases of neglect the boys had told him about.

→ See Page 73

Chrysler Recommends Inspection of '59 Imperial Ignition-Starting Switch

In order to avert any malfunctioning condition, Chrysler recommends that the ignition and starting switch be removed and inspected on all 1959 Imperial models up to and including the following serial numbers: M617—100030; M637—100057 and M657—100031.

Any switch which does not have the name "Lake Center" or "Aetna Pollak" moulded into the case should be replaced by a new switch, Part No. 1838984-P.

If any switch on a '59 Imperial or Chrysler (regardless of name identification) is found to be malfunctioning or arcing when the key is turned, it should be replaced by a new switch (Part No. 1838984-P).

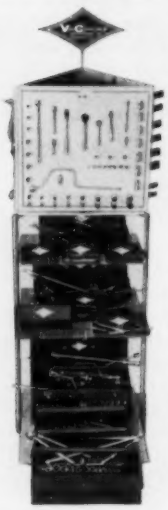
These are new *manufacturers' products*

HOW TO GET RUSH INFORMATION

If you want further information or literature describing the products shown in our "These Are New" pages, just use the handy Business Reply Card you'll find further back in this issue. Whether you want information on one or more of the products, all that is necessary is to mail this Postage paid card properly filled out to AUTOMOTIVE SERVICE DIGEST. Our Reader's Service Dept. will contact the manufacturers directly and see that you obtain the requested information as quickly as possible.

Rotating Tool Display

To introduce their new, popular-priced Vi-Chrome tool line, Herbrand Division, the Bingham-Herbrand Corp. is offering the "Roto-Tool Mart," planned for maximum visibility and accessibility. The revolving unit holds 96 different tools and turns at finger touch to bring them all within easy reach at eye level. Roomy shelves of the socket set merchandiser display the socket sets of the line, open for easy inspection.



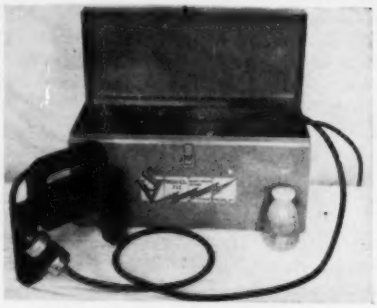
Notable features of the Vi-Chrome line are new, popular length combination wrenches; the straight, thin-walled socket design; all-new replaceable unit ratchets and the most popular set assortments.

(Circle No. 1 on Reader Service Card)

Magnetic Inspection Equipment

A new "Electro-Test" magnetic inspection instrument is announced by Storm-Vulcan, Inc., for detecting flaws and surface cracks in heads and blocks before and after repairs are made, as well as in any ferro-magnetic materials.

The instrument is compact and portable and can be used in any location where 110-volt current is available. All of the winding used in the inductors is formed with heavy Formvar which is highly resistant to abrasion. The panel switch, pilot light and fuse extractor post are rated to JAN specifications.



(Circle No. 2 on Reader Service Card)

Rubber Lubricant Improved

New, clear Ru-Glyde, an improved triple-purpose rubber lubricant that is said to be clean and easy to use, never settles out and requires no shaking, has been announced by American Grease Stick Co., who further states that the product is now better than ever for mounting and demounting tube and tubeless tires, lubricating rubber parts and fittings, and cleaning and dressing up rubber, plastic, and leather.

(Circle No. 3 on Reader Service Card)

AC Offering "Service Light"

Retailers of AC Spark Plugs are now being offered a versatile, "gooseneck" service light with the purchase of an eight-pack of AC Type 46 Spark Plugs.

Constructed of lightweight aluminum, the flexible "gooseneck" lamp is especially designed for service under the hood or chassis of a car or at the work bench. An exclusive feature of the lamp is its aluminum "shade within a shade" that protects the bulb and eliminates accidental burns from brushing against a hot bulb.

The lamp's universal radiator cap adapter provides for mounting the "service light" on the radiator. A second adapter provides for mounting the lamp elsewhere—on the work bench or on a mechanic's "creeper" for work under a car. An 18 ft. extension cord completes the unit that will serve either an ordinary or heavy-duty light bulb.

(Circle No. 4 on Reader Service Card)

Pocket-Size Battery Tool

A pocket-sized, long wearing, battery terminal clamp and post cleaning tool, which really works, has been added to the Blue Bird line of battery tools manufactured by Bergman Tool Mfg. Co., Inc.

Two stiff metal brushes have been combined in a self-contained cadmium plated steel case. The coned shaped brush on top reams and cleans terminal clamps, while the doughnut shaped brush in the base fits over the post to clean and shape it with a few quick turns. A metal top encloses the brushes so that the tool can be handled easily in cleaning the battery posts and kept in the pocket without damaging the fabric of trousers or coveralls.

(Circle No. 5 on Reader Service Card)

Air Conditioner Tester

Liaison Engineering Services announces the Calorimeter-Comparator, designed especially for checking the operating effectiveness and capacity of automobile air conditioners by indicating in BTU's the heat removed by the air conditioner in actual operation.

The unit has overall dimensions of only 16½" x 9" x 6½", weighs approximately 6 lbs., and is entirely self-contained. With it the mechanic can test all current automobile air conditioners for efficiency.

(Circle No. 6 on Reader Service Card)

Air Operated One-End Lift

A new 1½-ton air operated one end lift (model SJ-51) is announced by the Blackhawk Mfg. Co.

The new unit has a standard two-way lever valve that uses either a tire inflator or quick coupler for ease of operation, and lifting arms extend from 14" to 48" to accommodate the many different styled bumpers, tail pipes and extreme widths of late model cars.

Universal 5"x5" fixed saddles eliminate the need to bend underneath the car to adjust them for proper contact; weight loads do not have to be exactly centered, as the saddles scientifically spread the weight.

Also incorporated is the tricycle wheel design; the swivel nose wheel and large steel rear wheels help the jack move to work, position and lift faster. Extra long 25½" support legs spread out for added support when lifting.

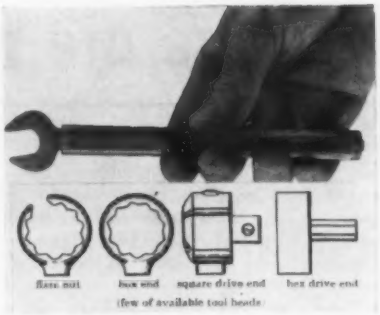
The elevator has been designed so that the lifting arms reach 14½" underneath the bumper to allow the saddles to firmly grip the brackets or pads, with clearance to spare, and automatic mechanical safety locks in any raised position from 8" to 30".

(Circle No. 7 on Reader Service Card)

Snap Torque Tool

A new torque tool that is said to do away with the dangers of over- and under-torquing precision work is now available from the Milbar Corp.

When using the Milbar Snap Torque tool, you feel and hear a "click" when the proper torque is reached; and, with a wide variety of tool heads to choose from it is easy to select the specific head designed for a specific job.



(Circle No. 8 on Reader Service Card)

How To Repair Acrylic Finishes The Easy Way!

Use These 3 New DITZLER® Products

1. DURACRYL* Lacquer Colors

2. DURACRYL Sealer

3. DURACRYL Thinner

*DURACRYL is a trademark of Pittsburgh Plate Glass Company

Now you can repair the new acrylic finishes used on many of today's new cars as easily as repairing standard lacquers. For this purpose Ditzler has developed a simple 3-point system of completely integrated acrylic products. DURACRYL colors are made from *a basically new chemical compound with* outstanding appearance and performance qualities. New DURACRYL is a distinctive, modern development of the research laboratories of Pittsburgh's Paint Division. Ditzler's new DURACRYL 3-point system can be used for spot touch-up or for complete refinishing on cars originally painted with acrylic finishes. DURACRYL colors are available in all the acrylic colors currently being used by manufacturers on new cars.

DURACRYL is now being used on the production lines by all car manufacturers using acrylic finishes as original equipment.

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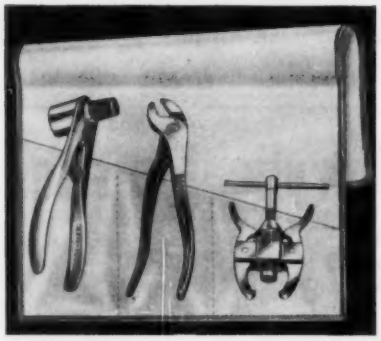
IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

These are new *manufacturers' products*

Battery Tool Kit

Ken-Tool Mfg. Co. announces a new set of battery tools consisting of a combination battery post cleaner and cable terminal spreader and cleaner, battery cable terminal puller, and battery pliers.

The newly designed battery post cleaner and cable terminal spreader and cleaner are two tools in one,



forged from alloy steel and heat-treated to provide hard use and long life.

The new battery cable terminal puller is made of forged steel and has a positive, super grip with plenty of power to spare; the battery pliers, designed specifically for battery work, are forged from chrome-nickel alloy steel and heat-treated for long life.

(Circle No. 9 on Reader Service Card)

Portable Tune-Up Set

King Electric and Equipment Co. announces a new portable tune-up set housed in a sturdy metal carrying case with convenient lead compartments. According to the manufacturer, testers are firmly locked in place, yet

readily removable for individual use, if desired.

The test instruments feature large professional-size meters and include: volt-amp test, coil test, condenser test, ignition-output test, 0-100,000 Ohmeter, cam angle test, tachometer, 6/12-volt powerlite, vacuum gauge and fuel pump pressure gauge.

The manufacturer states that this set of equipment is so simple to use that any shopman can operate it with the easy-to-follow instructions that are provided.

(Circle No. 10 on Reader Service Card)

Freon 12 Hose and Fittings

To simplify the installation and servicing of automotive air conditioning systems, The Imperial Brass Mfg. Co. announces a new line of Freon 12 hose in 50′ coils together with a variety of reusable hose couplings, so that any desired hose assembly can readily be made up.

Imperial's Freon 12 hose is designed to operate satisfactorily in the temperature range of minus 20°F. to plus 250°F., with recommended maximum working pressure of 350 psi. Hose is available in five sizes from 3/16″ to ⅝″ I.D. The hose has an inner seamless tube of synthetic rubber, reinforced with cotton braid, plus an outer cover of cotton braid impregnated with synthetic compound.

The company's cadmium plated steel reusable couplings are designed to assure maximum flow. Pipe thread ends are the Dryseal type. Female 45° flare swivel, male 45° flare connectors, and male pipe thread connectors are available in the standard sizes.

A complete package assortment of couplings and hose and assembly mandrels can be obtained together with a 21 drawer steel cabinet that fills all the needs for fast, correct air conditioning service.

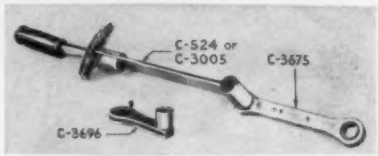
(Circle No. 11 on Reader Service Card)

Camber-Setting Ratchets

On 1959 Chrysler made cars, the camber adjustment must be made from under the hood, and it is imperative that the lock nut be torqued to 65-70 ft.lbs.

To facilitate this adjusting job, Miller Mfg. Co. is offering a set of special torque wrench ratchets. The extra leverage provided with the C-3675 long type ratchet reduces the actual torque wrench reading to 45 ft.lbs.

On those cars equipped with air conditioning and Auto Pilot, the front end adjustment on the left side is partially hidden. By using the C-3696 short ratchet and special drive adapter, however, the adjustment is easily

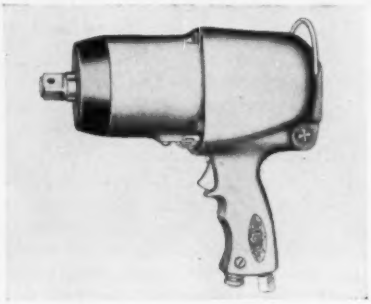


reached. When using the short ratchet, a torque reading of 55 ft.lbs. tightens the lock nut to the factory specification of 65-70 ft.lbs.

(Circle No. 12 on Reader Service Card)

Air Impact Wrench

Albertson & Co., Inc., announces a new ¾″ Air Impact Wrench with a rating of 700 ft.lbs. of torque at 90 lbs. of air pressure at the tool. This No. 320 is the first of many new models



and sizes being added to the Sioux air impact wrench line.

Among the new features common to the entire line will be the fact that they are "Reaction Balanced," meaning that the operator does not experience the usual pull as the wrench impacts. Less vibration and shock is carried back to the operator, and as a result there is less operator fatigue.

(Circle No. 13 on Reader Service Card)

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1-59

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"TECH KNOW-HOW" FEATURES

●ONLY ASD provides the automotive service field with timely, authoritative, detailed articles of this type. Prepared by men who have the actual experience, as well as the education to "live with" the increasingly specialized service needs of the modern automobile, these features go deeply into the methods and mechanical parts involved. Most "Tech Know-How" write-ups are step-by-step "how-to" descriptions of the latest procedures in a key servicing operation.

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AUTOMOTIVE SERVICE EDUCATION

● Toward the solution of one of the most acute needs of our industry, AUTOMOTIVE SERVICE DIGEST carries a continuing series of reviews on how and where the skilled technicians of tomorrow are being trained. Going deeply "into cases," the Service Education series answers the questions of prospective student and management alike.

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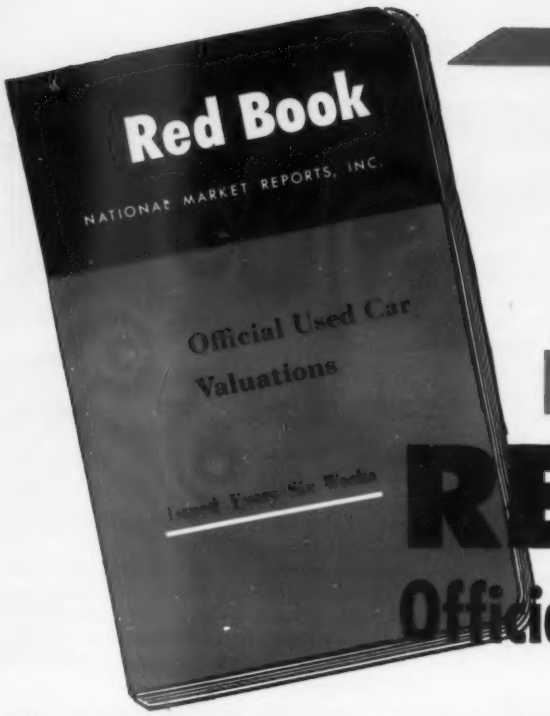

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RB-B

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These are new *manufacturers' products*

Steering Wheel Puller

The No. 615 steering wheel puller, recently announced by the Zim Mfg. Co., is a sturdy new tool that removes the steering wheel from the shaft of any present day American made car.

On the end of the screw, a removable shoe is held in place by a spring-pressed ball and it is adapted to engage the top of the steering wheel shaft and is prevented from slipping off the shaft by a projecting rim. The slots in this puller will admit ⅜" cap screws. The screw is of ample size and length and the body drop forged steel.

(Circle No. 14 on Reader Service Card)

Carburetor Clean-Out 'Zip Kit'

In answer to dealer requests for "most-needed-only" carburetor replacement parts for performing most clean-out jobs, Carter Carburetor is now offering an economy-priced clean-out "Zip Kit" which contains a needle and seat assembly, a pump plunger and a gasket set.

An added feature of the kit is its package, covered with colored metallic foil that makes it tamper- and moisture-proof.

(Circle No. 15 on Reader Service Card)

Fire Protection

Two new pressurized dry chemical portable fire extinguishers (2½ lb. and 5 lb. capacities) have been announced by Walter Kidde & Co., Inc., which are said to put out as much fire as eight and sixteen carbon tetrachloride portables respectively.

According to Kidde, their designs stress simplified, self-evident operation for anyone picking up a unit in a fire emergency. Simply aim the discharge nozzle at the base of the fire and push the easily depressed actuating lever. Immediately a cloud of fire killing dry chemical envelops the blaze. There is no trigger locking pin to remove, no valve to turn, no inverting, and no pumping.

(Circle No. 16 on Reader Service Card)

Fuel and Oil Line Repair Kit

A low-pressure fuel and oil line repair kit consisting of 36 popular hose ends in 12 styles and 20' of ¼" I.D. hose in a compact steel box is now being offered by The Weatherhead Co.

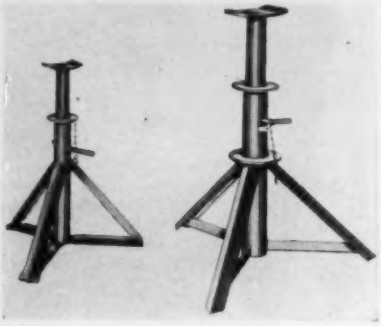
Known as the BL-13 Barbliner Hose Service Kit, it provides a basic inventory of Weatherhead bulk hose and re-usable ends. The "push-on" hose ends allow for easy assembly in a matter of minutes—just push the hose on the Barb-Tite end until seated under the protective cap, and it's on to stay, according to the manufacturer, to give a leakproof seal and positive grip.

(Circle No. 17 on Reader Service Card)

Safety Jack Stands

The Vulcan Mfg. Co., Inc., announces two new Safety Jack Stands. The passenger car Model #750 has a capacity of 2½ ton per stand, five ton per pair, with heights from a low of 14" to a high of 21". Truck Model #760 offers a capacity of 6 ton each, 12 ton per pair. Heights are from a low of 19" to a high of 28".

Both models are of pin type construction, are dependable, safe and easy operating. They are manufactured from high quality materials with superior welding and workmanship, and finished with a rust resisting lacquer.



(Circle No. 18 on Reader Service Card)

Wheel Weights

Two new, complete lines of X-Act wheel weights, in six series, for balancing passenger car, truck and bus wheels, are announced by Hunter Products Co., Inc.

The high-lustre, smooth-finish, slimline X-Act passenger car weight series includes the 10 "most-used" sizes, ranging from ¼ oz. to 6 oz. Exclusive molded "trim-off" increments allow 1/16 oz. accuracy on weight sizes up to 4 oz., and ⅛ oz. accuracy on the larger sizes. The weights are shaped for adequate hubcap clearance for today's modern hubcaps and will fit the rims on 14" wheels.

Four series of weights are available to fit most of the medium and heavy-duty rim types and wheel sizes used on today's trucks and buses.

(Circle No. 19 on Reader Service Card)

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B PARTS PRICES. Factory list prices cover all makes, all body styles for past eight years—convertibles and hardtops included.

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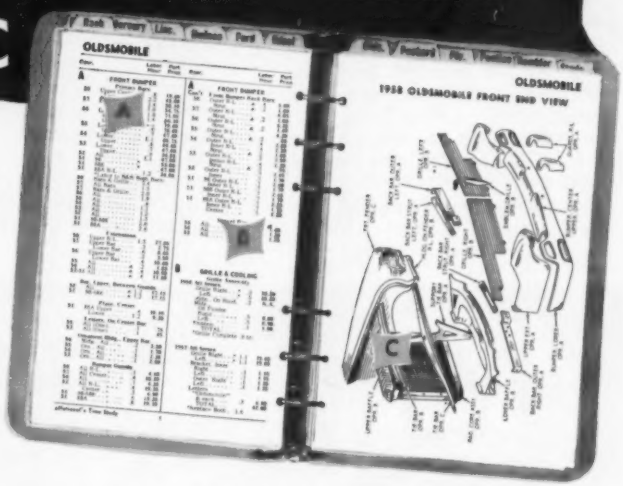

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(MJ)

These are new *manufacturers' products*

Combination Welder-Charger

A wide variety of utility welding operations, in addition to 6- or 12-volt battery charging, can be performed simply with a new, inexpensive power unit recently announced by the Welding Products Div., A. O. Smith Corp.

The 180-ampere unit plugs into any 230-volt outlet. Designed to accommodate a-c electrodes from 1/16" through 5/32", it has two welding ranges: one for deep penetration; the other for a smooth surface weld. Easy and safe to operate, the welder is protected with thermal overload circuit breakers to prevent damage due to accidental misconnection or misapplication. Fan cooling provides high-velocity cleaning and cooling air to

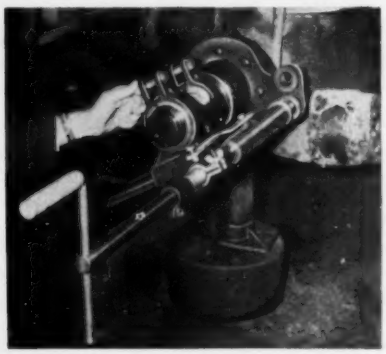
the coils and internal parts.

Batteries can be completely charged in less than 1½ hours, sufficient charge for starting may be added to any battery in less than 20 minutes. The charger features silicon rectifiers.

(Circle No. 20 on Reader Service Card)

Boring Bar for Truck Brakes

Through use of the Lucker D-500 Boring Bar, shown in use here, distorted or worn anchor and cam pin holes on truck rear wheel brakes can be bored quickly and accurately to receive oversize bushings. By rebushing



these holes, the manufacturer states that brake alignment is brought back to square and true factory tolerances, giving 100% brake lining contact to increase lining wear and eliminate squeal and soft brakes.

In addition, the boring bar can be used with a king-pin adapter to accurately and efficiently rebore the king pin holes in the front steering spindles.

(Circle No. 21 on Reader Service Card)

Say You Saw It In
Automotive Service Digest

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THE SAFE
AND SANE WAY
TO CLEAN
Automotive and
Industrial Parts
Ideal for the critical cleaning
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units.
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(less Jet
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SAFE! Fast drying—leaves no film
America's Foremost Producers of Parts Cleaning Equipment
PRACTICAL MFG. CO.
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2840 4th Ave. S.
Minneapolis 8, Minnesota

Battery Hold Down Assortment

Champ-Items, Inc., announces a battery hold down assortment containing 12 hold downs in 7 sizes that

will service about 95% of the cars and trucks on the road today.

Made of vinyl coated steel to prevent corrosion, the clamp can be placed in any bolt position on either ends or sides.

(Circle No. 22 on Reader Service Card)

Floor Mats

A completely new Van Guard line of heavy, quality rubber floor mats in eight striking colors is announced by Ace Rubber Products, Inc.

The line includes a door-to-door coverall mat for front floors, utility mats for front or rear, and twin mats for front floors—all attractively packaged.

(Circle No. 23 on Reader Service Card)

Mobile Brake Shop

The new "heavy duty" Mobile Brake Shop, recently announced by Ammco Tools, Inc., includes the company's Model 3000 "Safe-Turn" brake drum lathe, Model 2000 "Safe-Arc" brake shoe grinder, and other accessories required to handle passenger cars, light trucks and most medium truck work.

The extra-rugged heavy gauge steel mobile bench can be moved with "fingertip control" to allow work anywhere inside or outside the shop. There is shelf space below and work space above on the masonite covered top.

The unit comes complete, as illus-

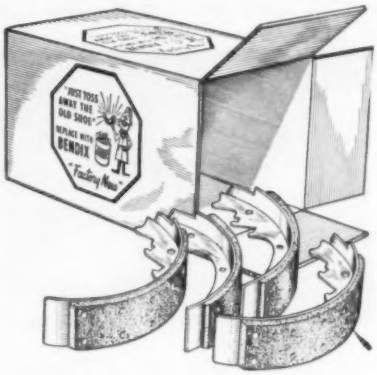
trated, including metal accessory storage board and large 3-color merchandising sign.

(Circle No. 24 on Reader Service Card)

Bendix "Throw Away" Plan

The slogan "Just toss away the old shoe and replace with Bendix factory-new" sums up the recently announced Bendix program for selling brake service work.

According to T. A. Kreuser, Manager, Service Sales Dept., Bendix



Products Division, the modern way to do a brake job is to remove the old worn out brake shoes from a vehicle, throw them away and replace with a new set of Bendix shoes.

Because Bendix Brakes are designed for each individual vehicle make and model, they are said to always fit correctly, go on easily and require no unnecessary time consuming adjustments.

(Circle No. 25 on Reader Service Card)

New Hand Cleaner Dispenser

Mac's Super Gloss Co., Inc., announces a new "slip-on" type of dispenser which uses the Mac's Waterless Hand Cleaner can itself as a can-

nister, eliminating the fuss and bother of transferring cleaner from can to dispenser.

Its sturdy construction and simplicity of design assure effective, trouble-free operation, yet the dis-

1. Turn can upside down and remove plug.
2. Turn can right side up and slip on dispenser.
3. Remove lid. Drop in follow-plate.
4. Replace lid loosely. It's ready to use.

penser is priced far below other hand cleaner dispensers on the market.

As shown in the illustrations, a 5 lb. can of hand cleaner slips on the dispenser quickly and easily in four simple operations.

(Circle No. 26 on Reader Service Card)

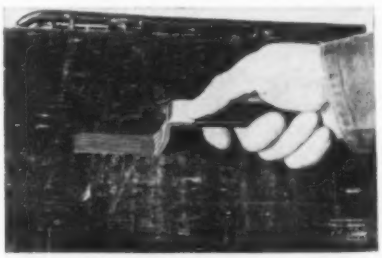
Window-view Mirror

Full six-lane visibility is offered by a new type of interior rear-view mirror announced by Visionade Manufacturing Co. Designed to take advantage of the enlarged window area of 1959 models, this extra-large mirror is especially suited to high-speed turnpike driving. Measures over a foot long; is made of non-glare glass, backed with chrome-plated brass. Comes with adapters for simple installation; and in two models that will fit all cars from 1954 through 1959.

(Circle No. 27 on Reader Service Card)

Cooling Fin Comb

A comb for straightening bent cooling fins on automotive air conditioning condensers is announced by the



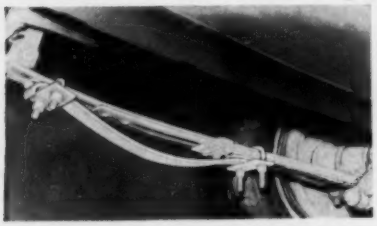
Miller Mfg. Co. One tool fits all condensers with 12 fins per inch, and, according to the manufacturer, will comb out the cooling fins quickly and easily.

(Circle No. 28 on Reader Service Card)

These are new *manufacturers' products*

Car-Truck-Trailer Stabilizer

An adjustable stabilizer, "Level-Ride," for rear leaf springs has been introduced by Imperial Manufacturing Company. Featuring an exclusive *Torsional Adjustment* for height control, the device is claimed to provide safer, smoother riding for cars, light



trucks and trailers. The height control adjustment is said to restore true arc to sagging springs.

Construction is of silico-manganese tempered spring steel. No special tools are required for installation. Each set weighs 10 pounds, and comes packaged in a display selling carton that includes complete instructions. According to the manufacturer, the stabilizer increases carrying capacity up to 1,000 pounds; adds life to springs and shock absorbers, and results in increased tire mileage.

(Circle No. 29 on Reader Service Card)

Replacement Wiper Arms

Adjustable for pressure, length and blade angle, new ANCO Red Dot replacement wiper arms are especially designed to meet the heavier pressure needs of blades 15″ and longer. "Quick fits" all cars using 14-19″ wiper arms, according to the manufacturer, The Anderson Co. Comes in two models: "DH" for the ⅝″ diameter drum head wiper shafts; "SH" for screw-head shafts.

(Circle No. 30 on Reader Service Card)

Rod Reconditioning Mandrels

Sunnen Products Co. announces a new series of connecting rod reconditioning mandrels (journal end) to cover the 3.300″ to 4.700″ diameter range; necessary for reconditioning large fleet and off-the-highway type vehicle con rods. Each mandrel covers a .200″ diameter range and uses the standard CR type stones and shoes.

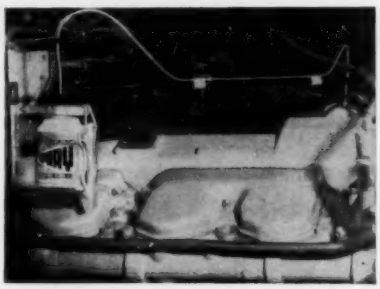
With the introduction of these larger mandrels complete coverage from 1.500″ to 4.700″ in diameter is now possible. These mandrels are especially designed to provide a round, straight rod bore and allow the user to recondition rods to original factory size, assuring a perfect fit of inserts.

(Circle No. 31 on Reader Service Card)

Starting Fluid Applicator

Spray Products Corporation has introduced a closed-system type of applicator for use with its standard cans of Spray Starting Fluid. Result of two years of experiment and field testing, the "Instnstart Applicator" injects finely atomized fluid directly into the intake manifold without waste of the liquid or release of odorous flammable vapors into the air.

It is designed to fit any engine, use only a small space, be installed in a

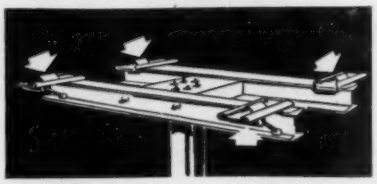


few minutes with only a drill and a screwdriver. In use, it can be operated much like a choke—the driver pulls a knob to release a flow of the starter fluid; pushes it to cut-off the flow. Thus, he can start and warm up the engine "by ear." The fluid for use in the new system in a pressurized can, containing enough for about 75 starts at freezing; half that number at 0 degrees F.

(Circle No. 32 on Reader Service Card)

Hoist Conversion Kit

Conventional grease rack hoists are converted to frame contact hoists by means of the "Lift-Rite" conversion kit just introduced by Beverly Equipment Sales Company. Described as providing safe frame contact on domestic and foreign cars, as well as



light trucks, the kit consists of four passenger car adapters and four truck adapters. Instructions are included.

Said to be easily installed in a matter of minutes, the conversion assembly permits the car wheels to drop free from fender walls, so that there is ready access for all under-car repairs. Descriptive literature and prices are available on request.

(Circle No. 33 on Reader Service Card)

Auto Body Filler

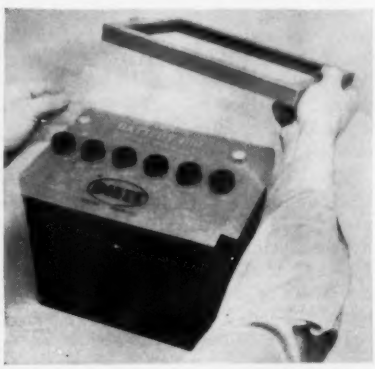
Introduced by Jaycee Chemical Corp., "R-P" Bondo is claimed to be one of the easiest of formulations to use. The new polyester resin comes with the resin and the catalyst in different colors— when all trace of the white catalyst has disappeared, the product is ready to apply. According to announcement, it is flexible and can withstand severe banging and vibration without checking, cracking or splitting.

It is said to harden from the inside and work toward the surface, providing a firm, positive bond. Patch set time can be speeded or retarded by varying the amount of catalyst. Patch hardens at room temperature without need for heat lamps, and can be filed or sanded as late as 24 hours after setting.

(Circle No. 34 on Reader Service Card)

Battery Bib

A new, simple and inexpensive device which is said to protect automotive storage batteries against loss of



power and premature failure is now being offered by the R. E. Dietz Co.

Called Battery Bib, the new item is a special polyethylene sheet, perforated to fit snugly over the filler plugs and terminal posts of all popular automobile batteries. When in place, the bib covers the top surface of the storage battery, protecting it against oil, water, grease and the corrosive action of acid fumes which tend to shorten battery life and cause voltage losses of as much as two to three volts in a 12-volt system.

(Circle No. 35 on Reader Service Card)

Brake Conversion Unit

"Stage Matic Power Brakes," available for cars of all makes from 1952 to current models, are claimed to provide three times more braking power. Replace standard master cylinder. Unit is said to be easy to install with-

in 30 minutes, without special tools, cutting of lines or push rods.

According to the manufacturer, the Stage Matic brakes operate with 100 per cent efficiency whether the motor is running or not . . . permit faster, safer controlled stops . . . require little pressure, and are not adversely affected by intense heat or cold, rough roads, water or high altitudes.

(Circle No. 36 on Reader Service Card)

Distributor-Carburetor Set

New adjusting tool, No. 132, announced by K-D Manufacturing Co.,

consists of a flexible cable with reversing bit plus one magnetic distributor cap "window holder." The ⅛" hex end of the bit is for contact points of Delco-Remy external adjustment distributors; the standard screwdriver end, for carburetor adjustment on late models where a solid screwdriver cannot reach. Overall length is 18½". Screwdriver bit is hooded by sleeve on cable end; has plastic guide marks to measure turns.

(Circle No. 37 on Reader Service Card)

Windshield Washer Solvent

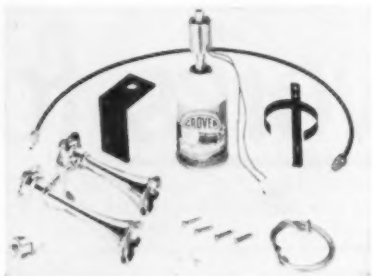
United Motors Service announces a new Delco "non-foaming" windshield washer solvent. Added to water, the Delco Solvent is said to create a

solution that will not stain car finishes; help dissolve and remove road film, bugs and grime; leave windshields clear without spotting, and assure anti-freeze protection in the washer jar.

(Circle No. 38 on Reader Service Card)

"Mile-Long" Safety Horn

New Grover "Mighty Midget" air horn, just introduced in kit form, is described as clearly audible up to a mile away. Available for six- or twelve- volt systems, the kit includes



electric remote control and universal mounting brackets to permit quick, easy installation on cars and trucks. Sleek chrome twin horns add to beauty as well as safety, the maker claims. Pressure is provided by a replaceable half-pint cylinder of Freon, which supplies up to 1,000 blasts.

(Circle No. 39 on Reader Service Card)

Automotive Clinic . . .

(Continued from page 11)

power is required to get the car out of sand, deep snow, etc. Otherwise, the car is always started in Drive, with the full range of torque changes taking place automatically in the torque converter. If the shift from Low to Drive is rough, it is probably because the clutch does not release at the time the band takes hold, and the overlap might cause what you refer to as roughness. Possibly adjusting the linkage may help the situation, but the complaint as you outlined it cannot be serious if the transmission is used as it is supposed to be used.

Rough Shifting Transmission

I recently purchased a '52 Plymouth Cambridge Synchro transmission without overdrive. It was slow and rough in shifting from low to second. Also rough between second and high. Smooth shift from neutral to low; and smooth from neutral to reverse. Transmission quiet running in all gears. Installed new clutch and pressure plate. Pilot bushing in crankshaft good. Free fit on drive pinion. No noticeable wear in any bearings, gears or end play. Shifter forks and shafts like new detent balls free working. Interlock works perfectly. Selector works freely. Installed new Borg Warner synchronizer assembly with spreader spring. It shifts fine from second to high now but very little improvement from low to second. If a shift is made from low to second at 5 to 10 mph. it works fairly well. Can you give me any help?—*R.C., Wellsville, Kansas.*

Answer: Rough shifting between speeds on the conventional transmission is usually due to the synchronizing mechanism. If either the cone or recess into which it fits are worn, or the spacing of them is not correct, the gears which are to mesh do not come to the same speed and will clash. The blocker gears must be at same speed when they slide together to make a smooth shift. By rough shifting we assume you mean clashing of the blocker gears. On this car, a 1952, which is now seven years old, there is undoubtedly wear if the car has received the normal amount of use. If you disassemble the transmission again, check the fit of the synchronizing clutches and be sure they engage properly. As the only trouble now seems to be in the shift from first to second, check this clutch. Be sure, too, that the engine clutch disengages fully when shifting.

Say You Saw It in
Automotive Service Digest

Businesspaper advertising brings you information on new and better products, alerts you to new processes and production methods by which you can improve your own products. That's why it pays to read the advertising in your businesspaper. Helps you keep an ear to the ground for new and important developments you can put to work—profitably.

BETTER PRODUCTS
LOWER PRICES
MORE JOBS

Businesspaper advertising helps to lower prices of the products you buy and sell by broadening markets, building sales volume, bringing you cost-saving opportunities. When you're looking for ways to lower costs and prices . . . give better value . . . and improve profits, it's the editorial pages of your businesspapers that tell you *how* —and the advertising pages that tell you *with what.*

Businesspaper advertising helps create demand, improve products, step-up production, distribution and sales. With new companies, new factories, new products, new services constantly being developed, you get a healthy, vigorous economy—a full-employment economy. Yes, sir! Advertising works. And it works for you.

Advertising works for you!

Advertising Federation of America

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Prepared for AFA and AAW by the Associated Business Publications in the interest of better understanding of businesspaper advertising.

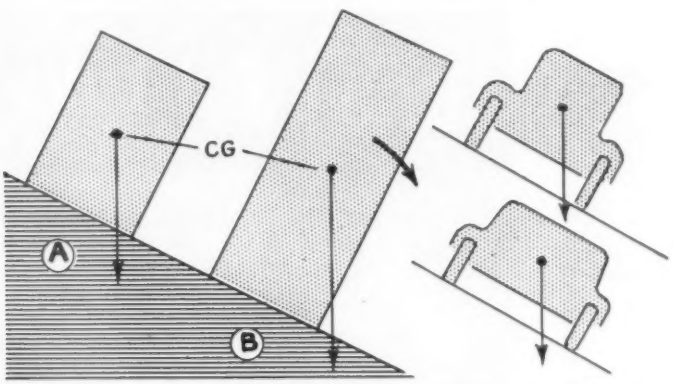
BRUSHING UP ON THOSE EASY-TO-FORGET THINGS

Refresher course

✓ *Meaning of Stability*

• GENERALLY SPEAKING, the center of gravity (CG), of a body is the point at which its whole weight can be considered concentrated. Knowing this it helps to understand the term "stability."

For example, if the object, "A," is placed on an inclined plane and a plumb line is dropped from its center of gravity, note that the line falls within the base supporting "A." If a second object, "B," twice the height of "A," but with the same-size base is put on the incline, note that the plumb



Stable object (A) and unstable object (B) on inclined plane. Right, showing greater stability of modern car (lower view).

line falls outside the supporting base. That means, object "B," will tip over.

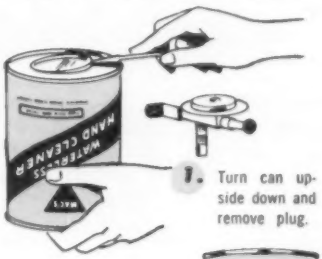
It might be said in general, that an object will be stable—will not tip over—as long as a line from its center of gravity passes within the base. This is called the condition of stability.

Some objects, of course, are easier to tip over than others, even if they will not tip of themselves. That's because of lighter weight, a narrow base, considerable height and so on.

One reason modern cars are more stable on turns at higher speed is that the vehicle of today has a wider base and lower center of gravity than older models.

NOW A HAND CLEANER DISPENSER THAT LOADS IN LESS THAN 1 MINUTE!

New 5-lb. can of Mac's Waterless Hand Cleaner slips right on dispenser. Here's all you do:



1. Turn can upside down and remove plug.

2. Turn right side up and slip on dispenser.

3. Remove lid. Drop in follow-plate.

4. Replace lid loosely. Dispenser is ready to use. Always works. Foolproof.

Introductory offer:

Two 5-lb. cans Mac's Waterless Hand Cleaner and new slip-on dispenser $7.11

Mac's Waterless Hand Cleaner can be used with or without water. Contains Lanolin . . . won't dry skin. Your NAPA or company jobber has it. Order now!

MAC'S

MAC'S SUPER GLOSS CO., INC.

Los Angeles 42, Calif. • Cincinnati 26, Ohio

DON'T WAX IT, MAC'S IT!

Literature:

manuals, catalogs and charts

most items are yours for the asking

FRAME-BODY WORK . . . 16-page catalog (L-1623) photographically illustrates and explains in detail how John Bean's new line of stationary frame and body correction equipment can be used with a floor or pit-type wheel aligner for correcting all types of body and frame damage. Also available is a 4-page catalog (L-1630) which describes a complete line of portable frame and body correction equipment for setting up under the vehicle. In addition, the catalog includes a list of frame gauges, support stands, jacks and jack accessories and precision instruments for use in frame and body repair work.

(Circle No. 40 on Reader Service Card)

ALTERNATOR SYSTEMS . . . Four-page illustrated folder graphically illustrates how the new Leece-Neville silicon rectifier has been successfully combined with the basic alternator, thus providing an alternator system with only two components instead of the previous three (the alternator, the rectifier, and the regulator). More than 30 illustrations highlight design and application features.

(Circle No. 41 on Reader Service Card)

MUFFLERS and PIPES... New 52-page catalog contains the latest muffler and pipe information for all popular numbers of passenger cars and light trucks, including 1958 models. Also featured in the catalog are valuable sales promotion ideas and information, as well as helpful dual installation tips.

(Circle No. 42 on Reader Service Card)

TBA DEALER CATALOG... United Motors Service division of General Motors announces a revised, broader-coverage TBA-Dealer catalog to provide a quick preference guide to application and specification data on popular and fast-moving service parts for cars and light trucks. Included in the new edition are Rochester carburetors, Moraine gasoline filters, Delco brake fluid, Delco hydraulic brake parts and New Departure front wheel bearings. Other sections cover Delco batteries, Delco-Remy ignition parts,

Rajah

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HAND CRIMPING TOOL
Order from Your Jobber or Direct from Us. Send for Circulars and Prices

It Cuts
And Strips
And Also Crimps
Rajah Terminals to ignition cable without the use of solder or any other tools

The Rajah Co. 35 VERONA AVE. NEWARK, N. J.

Brake-Cyl-Lube

- Insures smooth cup movement in wheel cylinders
- Protects ends of cylinders from rust and corrosion

Handy Plastic Squeeze Bottle
ONLY 60¢

Quart Refills $1.50

Display Carton of 12 bottles $7.20

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You may want this information, and most of it comes to you free. Just circle the key number on the Reader Service Card corresponding to the one that appears with the editorial review. Our Reader Service Department will forward your inquiry to the manufacturer or supplier for attention.

Delco-Remy charging circuit parts, Packard Cable products and Delco shock absorbers.

Catalog (No. 60A-1000) sells for 25c, and is available through UMS distributors.

(Circle No. 43 on Reader Service Card)

TIME AND LABOR SAVERS . . . New, eight-page Ken Tool Catalog (Supplement No. 4) illustrates, describes and includes complete specifications covering such time and labor saving tools as the company's new axle stands; bead breakers; heavy-duty bead loosening and tire removing tools; battery tools; tire buffing spoon; electric tire & tube buffer; flange type axle puller adaptor; taps; dies; screw extractors; die stocks; a new universal drain wrench; and numerous other time-saving tools.

(Circle No. 44 on Readers Service Card)

ELECTRICAL EQUIPMENT . . . A revised edition of Delco-Remy's booklet *Original Electrical Equipment for 1959 Passenger Cars* (DR-5210) is now yours for the asking. The booklet contains 20 pages with 33 illustrations which discuss the internal construction of the Delco Battery, the external adjustment type distributor, the enclosed shift-lever cranking motor, standard and extra-duty generator—as well as recommendations for periodic servicing, checking and adjusting of the charging, starting and ignition systems. A special section describes miscellaneous electrical equipment available—such as Delco-Remy's new self rectifying a.c. generator and transistor regulator—where extra electrical output is needed.

(Circle No. 45 on Readers Service Card)

AIR COMPRESSORS . . . and paint spraying equipment available from Campbell-Hausfeld Co. are fully illustrated in 24-page catalog which gives detailed information on eight compressor series, two new series of paint spray guns, and complete accessory equipment. Uses for the specific equipment are listed and illustrated, along with construction specs, model information and performance data. A special three-step selection guide chart explains how air source, materials to be used, coverage and finish, determine gun choice.

(Circle No. 46 on Readers Service Card)

FUEL PUMP CATALOG . . . A quick-reference fuel pump catalog is announced by Wells Mfg. Corp. covering their complete line of CaPac maximum capacity fuel pumps for all cars and trucks; fuel pump repair kits, diaphragm kits; and push rods for use with fuel pump replacements on Ford, Lincoln, Mercury and Chevrolet.

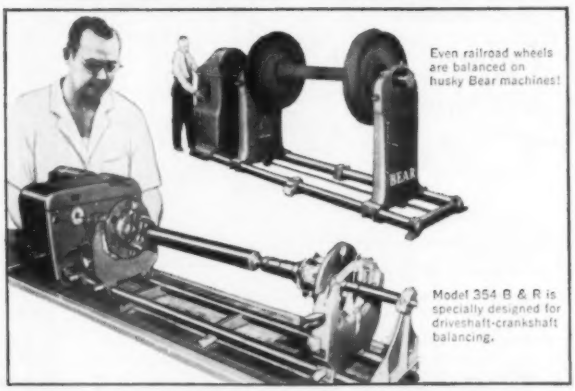
(Circle No. 47 on Reader Service Card)

FILTER WALL CHART . . . A new automotive filter wall chart is available from Purolator Products, Inc. which lists oil, air and fuel replacement filters for all 1959 cars, as well as refills and installation kits for foreign make cars.

(Circle No. 48 on Reader Service Card)

HYDRAULIC PRESSES . . . Fully-illustrated, 8-page bulletin is devoted to thirteen manual and air-operated

THE "BIG MONEY" BETS ON BEAR...


Even railroad wheels are balanced on husky Bear machines!
Model 354 B & R is specially designed for driveshaft-crankshaft balancing.

TO BALANCE DRIVESHAFTS AND CRANKSHAFTS RIGHT!

Reason: Bear brings all the extra profit-making advantages in speed, precision and performance of the industry's most experienced producer of balancing machines. No wonder you'll see Bear in leading jobber, engine rebuilder and fleet shops everywhere—and among the biggest names in U.S. Industry! Write for free catalog.

BEAR® BEAR MFG. CO., Dept. A-4, Rock Island, Illinois

...the world's most complete line of balancing machines

Harvey Jones says: "The radiator business was new to me until I opened my shop. During the first 9 months I grossed $18,000! I feel this was due to the excellence of my Inland equipment — plus the instruction and sales aids received at your school!"

Douthit-Carroll-San Chez Co., Memphis, Tenn., averages $300 a week!
Sidney Glass & Rad. Shop, Sidney, Mont., grossed $10,784 in a year!

WANT EXTRA PROFITS? There's a real radiator-servicing opportunity in your area right now — it's growing every day. Every auto-truck-tractor owner is a prospect. Modern cooling-system pressures now are so great that radiators require more frequent servicing.

Inland, world's largest radiator servicing equipment mfgr., offers equipment, training, Pays-For-Itself purchase plan — advertises nationally (Post and Life) to attract radiator servicing business to Inland-equipped shops. Mail coupon today.

INLAND MFG. CO.
1108 Jackson St., Dept. AD-1 Omaha 2, Nebr.

"SOLD EXCLUSIVELY BY MAIL"

FREE TRAINING SCHOOL
Factory school trains you or your men quickly: cleaning, repairing, recoring, resectioning, everything!

WRITE INLAND MFG. CO., Dept. AD-1 1108 Jackson St., Omaha 2, Nebr.
Please send new free book, "Blue Print For Profits."

FIRM _____ (PLEASE PRINT)
ADDRESS _____
CITY _____ ZONE ____ STATE _____
BY _____ TITLE _____
If dealer, make of car sold _____
Are you now operating a radiator dept.? ☐ Yes ☐ No

Trade Literature . . . CONTINUED

ACCO hydraulic presses—from a 3-ton mechanical arbor press to 25, 40, 60, 80, 125 and 150-ton units. Detailed specifications of all units, their capabilities, capacities, dimensions and weights are listed in clear and concise tabular form in conjunction with two-color illustrations of the presses.

(Circle No. 49 on Reader Service Card)

JACK REPAIRS . . . Four-page Hydraulic Jack Repair Manual contains information to help determine the cause of jack failure, and how to correct the trouble. Information is arranged in easy-to-follow sections, covering all areas of jack failure and repair. It enables any mechanic with adequate tools and the required parts to make most all repairs necessary in the average hydraulic jack breakdown.

(Circle No. 50 on Reader Service Card)

EXHAUST SYSTEM PARTS . . . Pratt Muffler Division's new 12-page dealer catalog is a complete index of mufflers, tail pipes, exhaust pipes, hangers, clamps and grommets for popular vehicles dating back to the early 1940's, as well as a complete listing of dual exhaust sets. Also cataloged are many of the company's point-of sale merchandising materials.

(Circle No. 51 on Reader Service Card)

CLEANING EQUIPMENT . . . 6-page brochure illustrates and describes the Ace-Sycamore, Inc. line of hand-portable electric cleaners for blowing, vacuuming and spraying, as well as large-capacity, tank-type blower and suction equipment capable of wet or dry pick-up.

(Circle No. 52 on Reader Service Card)

STORAGE LOCKERS . . . Just off the press is a new 8-page, 2-color catalog describing and illustrating the completely new Penco line of steel storage lockers. Twelve locker styles are presented, and tables are used to show the sizes available.

(Circle No. 53 on Reader Service Card)

SAFETY EQUIPMENT . . . Arrow Safety Device Company's reference guide to fleet safety equipment has all products grouped in order and covers the company's line of mirror assemblies, directional signal lights, stop and tail lights, clearance and marker lights, reflectors, interior lights, utility lights and roadside safety equipment.

(Circle No. 54 on Reader Service Card)

MUFFLERS AND PIPES . . . International Parts Corp. has a new, complete 1958 catalog of their mufflers, tail and exhaust pipes, and exhaust system parts. In addition to listing mufflers for all domestic cars and trucks, the catalog also lists mufflers for foreign cars.

(Circle No. 55 on Readers Service Card)

RADIATOR CAPACITIES . . . As an aid to shopmen servicing foreign cars, the Du Pont Company's 1958 anti-freeze protection chart lists 18 of the most popular imports and their cooling system capacities . . . in addition to all American cars from 1948 through 1958.

(Circle No. 56 on Reader Service Card)

MUFFLER SALE-SERVICE AIDS . . . A set of six muffler installation instructional cards is being offered by Maremont Muffler Division which contain helpful time-saving hints on tricky muffler and pipe installation problems, as well as a diagnostic chart for exhaust system needs.

(Circle No. 57 on Reader Service Card)

GRIND CRANKSHAFTS
✓ IN THE BLOCK
✓ IN THE LATHE
✓ IN THE STAND
The Winona Crankshaft Grinder has been giving fast, accurate service for over 20 years. It will grind crankpins from 1" to 3½" in diameter in the block! Or, with the crankshaft in your lathe it will grind crankpins and main bearings. A Grinding Stand may be used instead of a lathe. It enables you to control your price, profit and delivery. Write today for prices and literature.
WINONA TOOL MFG. CO.
WINONA, MINN. U.S.A.

Easy to reach
Near everything in
Detroit
HOTEL LEE PLAZA
GARAGE
DETROIT
Grand Boulevard turn off of Expressway No. 12, or Grand Boulevard turn off of John C. Lodge Highway leads you to the Lee Plaza. W. Grand Boulevard also intersects Routes No. 10 (Woodward Ave.), and No. 16 (Grand River Ave.)
• Ultra Modern Motel • A Fine Transient Hotel • Air-Conditioned • Dining Rooms • Ample Parking
rates from $4.50 per person two in room
including Continental breakfast
Lee Plaza
Hotel & Motel
2240 W. Grand Blvd.
DETROIT 8, Michigan

Refinish Surfaces . . . *(Continued from page 26)*

plying other coats, results are sure to be unsatisfactory.

While there is no way to avoid the swelling of lacquer undercoat that results when it is contacted by the solvent of a finish coat, the effects can be greatly minimized by starting with smoother metal.

In spot repair work, where the old finish is feather-edged around the bare metal, use fine sandpaper, not coarser than No. 360 or No. 400, to feather out the edge. Rubbing compound is sometimes used to get the edge surface even smoother. If rubbing compound is used, it is good practice to go over the surface with wax and grease remover because rubbing compounds usually contain some lubricant. Unless the edge is properly prepared, sand scratches will show up all around the feather edge.

On complete refinishing jobs to be done in lacquer, over old lacquer, the original surfaces should not be sanded with paper coarser than No. 360. An old lacquer film is not very soluble on the surface; but the underneath portion is readily soluble. When fresh lacquer is applied to an old surface that has been too coarsely sanded, the lacquer solvents penetrate the sand scratches and cause swelling. This effect is more marked on certain makes of cars, particularly in cold weather when the lacquer solvents are longer in contact with old film.

Penetration and swelling of old lacquer by the thinners in a new coat, can be prevented by spraying a sealer-gloss over the surface and allowing it to dry thoroughly.

LACQUER THINNERS

Many different thinners, of many different characteristics, are available on the market. They vary considerably as to the strength of the solvent and the speed of evaporation. Some thinners have very little solvent action. This type should be selected when an old lacquer job is to be refinished.

On the other hand, if the job is a touch-up on an old enamel-finished area, a thinner carrying a good proportion of strong, slow-evaporating solvents would be desirable. This type would cause the over-spray to blend and flow into the surrounding enamel. Care must be taken, however, to eliminate all sources of sand scratches; because this thinner will show them up after drying and shrinking.

What happens when one coat of lacquer is sprayed over another, as well as the shop temperature and the atmospheric humidity—both of which influence the evaporation rate of thinners—are key factors to the paint shop. On a cold, moist day, thinners tend to stay longer in a freshly-sprayed lacquer . . . and are more likely to penetrate the old finish. In hot, dry weather, thinners evaporate so rapidly that there is little penetration of the old coat unless a very wet coat is sprayed-on.

SCRATCHES IN SYNTHETIC ENAMEL

Although there are no strong solvents to contend with in finishing with enamels, many of the precautions already discussed here apply to this type of finishing also. Enamels dry with such a high lustre, that scratches show up readily. As a result, enamel finishing requires even more attention to a smooth undercoat than lacquer finishing. Careful sanding down with a fine grit is a must for a finish free of scratches.

KEY FINISH FACTORS

Of all the precautions necessary to obtain a fine body finish, those concerned with eliminating sand scratches are probably the most neglected. Yet, obtaining the best results is mainly a matter of having the basic knowledge covered here, and following the recommended procedures. Some of these take a little time—but it is amply justified by the results.

In brief, the six-point practice that will eliminate sand scratches involves: (1) keep the grade of the sandpaper fine; (2) keep the thickness of paint coats thin; (3) use the most suitable thinner, in the right quantity; (4) don't rush drying between coats; (5) keep shop temperature at or above 70 degrees, and the humidity as low as possible, and (6) give thought to the nature of the old finish.

42.6% of the replacement batteries shipped by the various battery manufacturers during 1957 were of the dry-charged type—57.4% were shipped "wet". 12-volt batteries accounted for 22.6% of the industry shipments.

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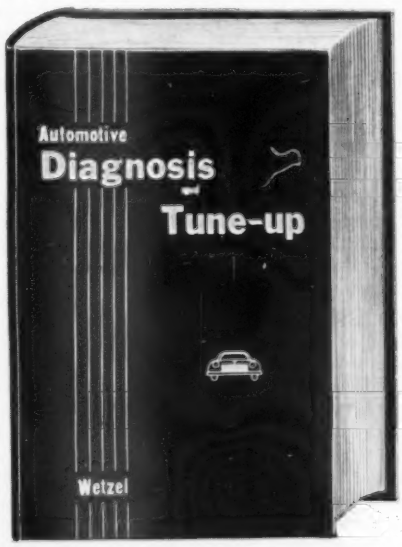

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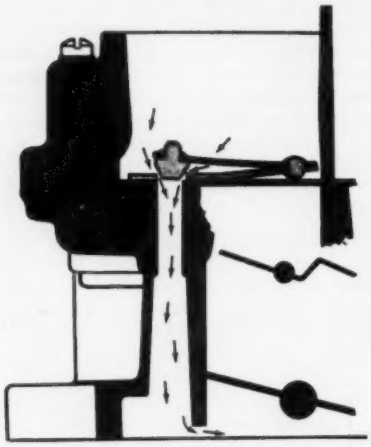
Carburetor . . . (Continued from page 22)

plunger bottoms in the cylinder, eliminating pump discharge. During high speed car operation, a vacuum exists at the pump discharge ports. To prevent fuel from being drawn through the pump circuit, the pump jets are vented by a cavity between the pump jet restrictions and the discharge ports. This allows air instead of fuel to be drawn through the pump discharge ports.

CHOKE SYSTEM

The choke system, located on the primary side of the carburetor, provides the correct mixture necessary for quick, cold engine starting and warm-up. To reduce the overall height of the carburetor, a choke countershaft over the secondary bores connects the choke linkage with the choke plate. When the engine is cold, tension of the thermostatic coil spring holds the choke plate closed. When the engine is started, air velocity against the offset choke plate causes the plate to open slightly against the thermostatic coil tension. Intake manifold vacuum applied to the choke piston also tends to pull the choke plate open.



Thermostatically-operated vent as on Cadillac, Buick and Pontiac 1959 carburetors. This opens when the temperature gets to the predetermined point, to admit additional air.

The choke plate assumes a position where tension of the thermostatic coil spring is balanced by the pull of vacuum on the piston and force of the air flow on the offset plate.

When the engine starts, slots located in the sides of the choke piston cylinder are uncovered, allowing intake manifold vacuum to draw warm air, heated in a tube running through the exhaust cross-over passage, through the choke mechanism. The flow of warm air heats the thermostatic coil and causes it to lose some of its tension, allowing the choke plate to open. The thermostatic coil loses its tension gradually until the choke plate reaches full open position.

If the engine is accelerated during the warm-up period the corresponding drop in vacuum allows the thermostatic coil to momentarily close the choke plate, providing a richer mixture. To combat engine stalling during warm-up on cool humid days, caused by carburetor icing, heated air from the choke housing is circulated through the passage in the base of the carburetor body.

To slow down the closing of the throttle to idle position, an internal dashpot is incorporated in the carburetor body. The dashpot consists of a plunger-type piston with a built-in intake check and a plunger piston return spring. The piston and spring are located in the dashpot cylinder which is cast in the right float bowl. The dashpot piston is connected to the primary throttles through exterior linkage. When the throttle is opened, the plunger spring raises the plunger to fill the cylinder below the piston. When the throttle is closed, the plunger is pushed downward, the intake check is closed and the fuel below the plunger is forced through a small restriction in the plunger stem. This delays the closing of the throttle plates by the hydraulic action of the plunger as it displaces the fuel trapped in the cylinder.

1959 CHANGES

On the Buick AFB the choke fast idle linkage has been redesigned. The fast idle cam is similar to the type used on Carter WCFB and WCD carburetors. This design permits the choke valve to float so that it can close a few degrees if necessary if the engine should falter while running on the fast idle. This feature helps prevent stalling during warm-up.

There is a new location for the intake accelerating pump check, which has been moved from the face of the carburetor flange to inside the carburetor bowl. The check is a one piece assembly instead of the plug, check-ball and seat previously used.

On the 1959 Lincoln only a disc type check is used with a bleed through the disc (shown in the insert on the drawing). The disc allows vapor to be vented from the pump circuit under heat conditions.

On the 1959 Cadillac and Lincoln, there is an added air bleed under the strut on the primary side of the carburetor. It is designed to smooth out the flow of fuel by acting as a variable air bleed which varies in proportion to the depression in the venturi. On Cadillac, a third air bleed has been added to obtain the required part throttle fuel mixtures.

The AFB is used 100% on Lincoln for 1959. The identification number 2853S is now stamped on the front ear for better visibility on the car. All AFB's except those on Pontiacs, have the number at this location. On 1959, Pontiac, there are two holes in the primary throttle plates to supply additional air to supplement that from the by-pass circuit. The spark port is eliminated; the passage now leads to intake manifold vacuum.

The most interesting improvement is the addition of a thermostatically controlled Hot Idle Vent Passage. During long periods of idling with an extremely hot engine, the fuel in the carburetor bowl becomes hot enough to form vapors. These vapors enter the carburetor bores by way of the inside bowl vents, mix with the idle air and are drawn into the engine, causing an excessively rich mixture and loss in r.p.m., or even engine stalling. Also, the decrease in density of the air due to high underhood temperatures, reduces the idle speed.

The thermostatically controlled idle air valve is calibrated to open under these temperature conditions, permitting additional air to enter the manifold below the secondary throttle valves, and mix with the fuel vapors, providing a more combustible mixture. The engine r.p.m. may still vary slightly; however, extremely rough idle and engine stalling are avoided.

The valve is calibrated to open when the air in the bore of the carburetor reaches a pre-determined temperature with 15 inches of vacuum applied to the valve seat. Valve operation cannot be checked accurately in field service, because of the difficulty of obtaining and measuring an accurate air temperature in the bore of the carburetor, and the specified 15 inches of vacuum at the seat of the valve. In service, if any doubt exists concerning the operation of the valve, it should be replaced. This is used on Cadillac, Buick and Pontiac. The valve assemblies differ in both air capacity and thermostatic material between carburetor models, so they cannot be interchanged from car to car.

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HE WHO LAUGHS, COME WHAT MAY,

WILL LIVE TO LAUGH ANOTHER DAY

Short circuit smiles

"Honey, I'd go through fire and water for you."

"Okay, make it fire. I'd rather have you hot than wet."

★ ★ ★

It was a very tense scene in the film. The audience sat enthralled. Suddenly the hero slapped the heroine in the face.

In the stunned silence that followed, a little voice piped up:

"Mommy," it said, "why doesn't she slap him back like you do?"

★ ★ ★

"Dear, I was at the doctor's today and he ordered a change of climate."

"Isn't that splendid! According to the weather report, it's coming tomorrow."

★ ★ ★

The rugged 6-footer in the hotel hall was fuming because the elevators had blown a fuse and were temporarily out of service. When the power was restored, he barked at the operator, "See that I get to the 5th floor immediately. I've got to pack for a mountain climbing expedition."

★ ★ ★

It was the draftee's first day in the Army and he was being briefed by his sergeant.

"Please get to the mess hall in time," said the sergeant gently, "and be sure to get up early. And please try to remember the proper uniform."

However, the next morning, the sergeant stuck his head in the barracks at 5:00 A.M. "Hit the deck, you slobs!" he roared. "Double time to the slop hall, then back and into fatigues for latrine detail."

"Why, sarge," gasped the rookie, "yesterday you were so different."

"Yesterday, you dope," bellowed the sarge, "we were on television!"

"Now madam, what can I do for you?" asked the butcher.

"I'll have a pound of fresh kidleys," said the lady.

"I beg your pardon," said the butcher; "a pound of . . . ?"

"Kidleys."

"Er . . . don't you mean 'kidneys' madam?"

"Certainly," replied the irate lady. "I said kidneys, diddle I?"

★ ★ ★

Getting ready to baptize the infant, the minister said: "His name, please?"

The mother answered proudly: "Randolph Morgan Montgomery Alfred Van Christopher McGoon."

Softly the minister spoke to his assistant: "A little more water, please."

"If anyone calls up and wants chains put on, tell them to bring in the wheels!"

"Wherever did you learn that dreadful word?" Jimmy's mother asked.

"Why from the Easter bunny," he answered righteously.

"From the Easter bunny!" exclaimed his mother.

"Yes, Mama," replied Jimmy, "last month when he fell over the chair in my bedroom on his way downstairs with the eggs."

★ ★ ★

Good neighbor: One who can watch you take it easy without thinking you're lazy.

★ ★ ★

The professor grimly eyed the class as he prepared to return a batch of examination papers. "You will remain seated while they are passed out," he commanded. "If you were to stand, it is conceivable that you might accidentally form a circle—which would make me liable for arrest."

"Why?" chorused several voices nibbling at the bait.

"For maintaining a dope ring."

★ ★ ★

It was during the Nazi regime in Czechoslovakia that a seedy character crept up to the counter of a store. "The Gestapo is after me," he whispered to the man behind the counter. "Please—hide me."

The shopkeeper scowled sternly, then pointed to a sign on the wall: "Positively no Czechs cached here."

★ ★ ★

"I turned out the lights—now let's pretend we're in heaven."

"But, honey, I'm no angel."

"I know—that's why I turned out the lights."

★ ★ ★

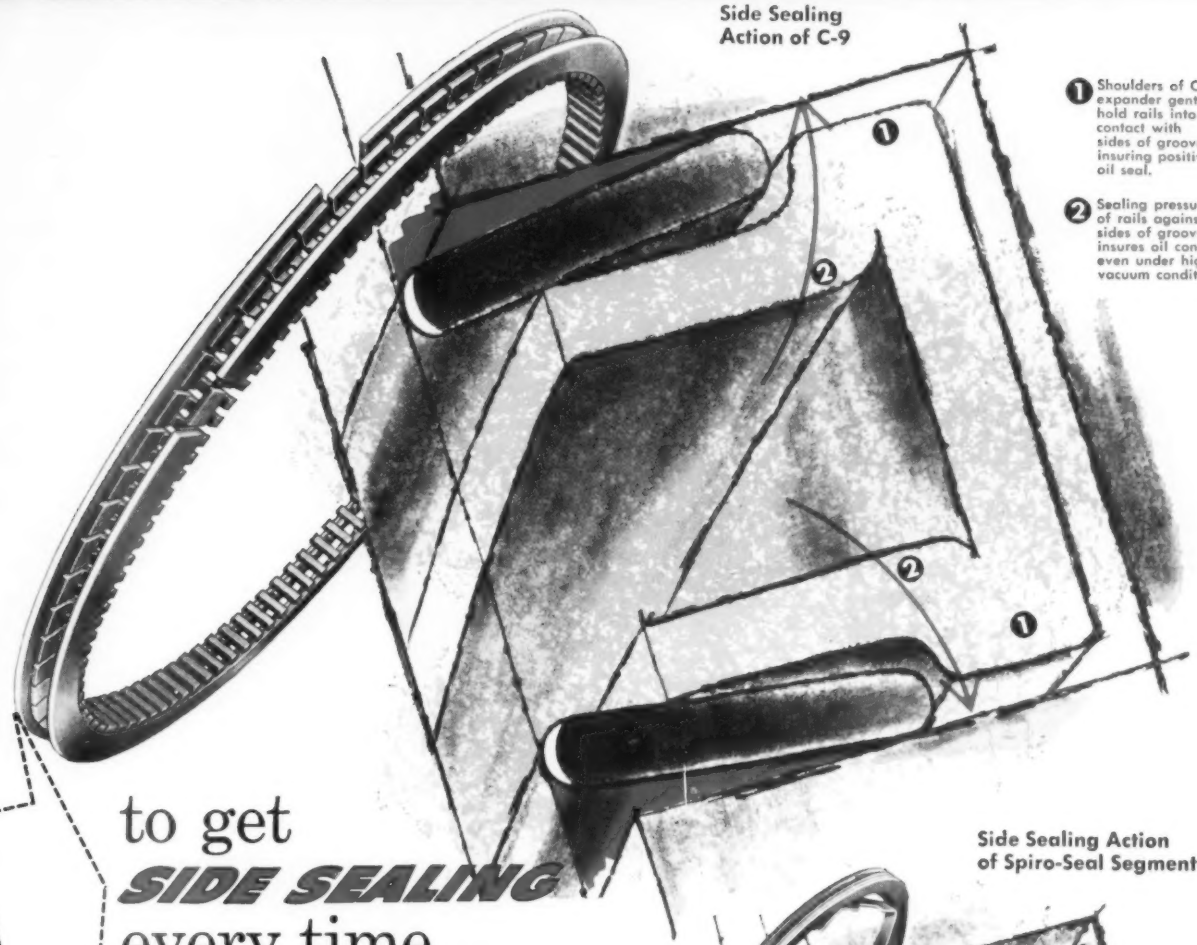
Then there was the cub reporter who was assigned to cover the class play at the high school. He wrote: "The auditorium was filled with expectant mothers and fathers, eagerly awaiting the appearance of their offspring."

★ ★ ★

Then there was the not-too-successful prize fighter that only won battles with his wife, who he had punched around every day for almost 20 years. Finally, the poor woman couldn't take it any longer and swore out a warrant for his arrest. When the case came up in court she told the judge about the repeated batterings. "Well, what do you have to say about this?" asked the judge.

"Don't pay any attention to her," answered the pugilist. "She's punch-drunk."

Side Sealing Action of C-9



1. Shoulders of C-9 expander gently hold rails into contact with sides of groove insuring positive oil seal.
2. Sealing pressure of rails against sides of groove insures oil control even under high vacuum conditions.

to get *SIDE SEALING* every time... power up with Ramco 10-up sets

Take a close look at these action blowups!

Note the "dishing" action of Spiro-Seal's segment. Note the "outward pressure" action of C-9's rails.

Only RAMCO sets provide this MODERN POWER action for *any* engine, old or new. Sides of grooves are positively sealed against oil "creep."

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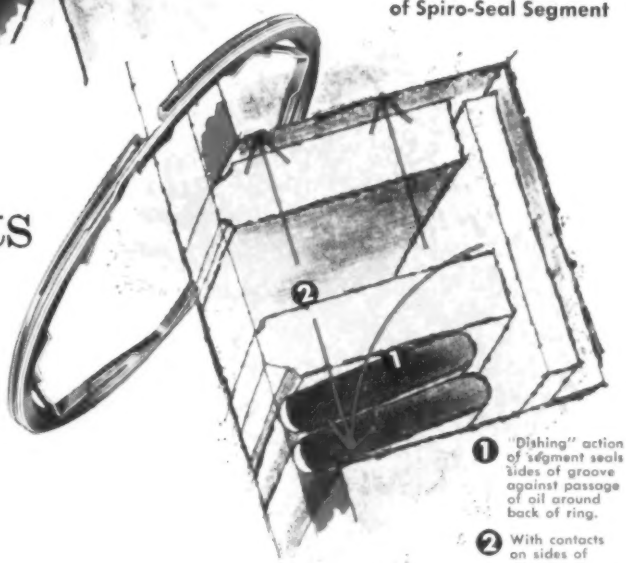

1. "Dishing" action of segment seals sides of groove against passage of oil around back of ring.
2. With contacts on sides of groove, immediate, positive oil control is assured.

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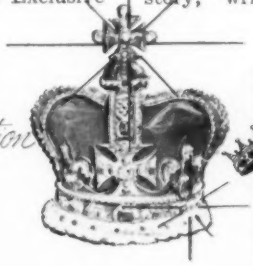

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